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All-Plastic Denture Service—*Kelly*

Characteristics of Gold Foil—*Thoen*

Full Mouth Reconstruction—*Edmand*

Zinc Peroxide—*Mallett and Guralnick*

Wrought Alloys—*Crawford and Phillips*

Temporomandibular Joint—*Block and Harris*

Complete Dentures—*Edwards and Boucher*

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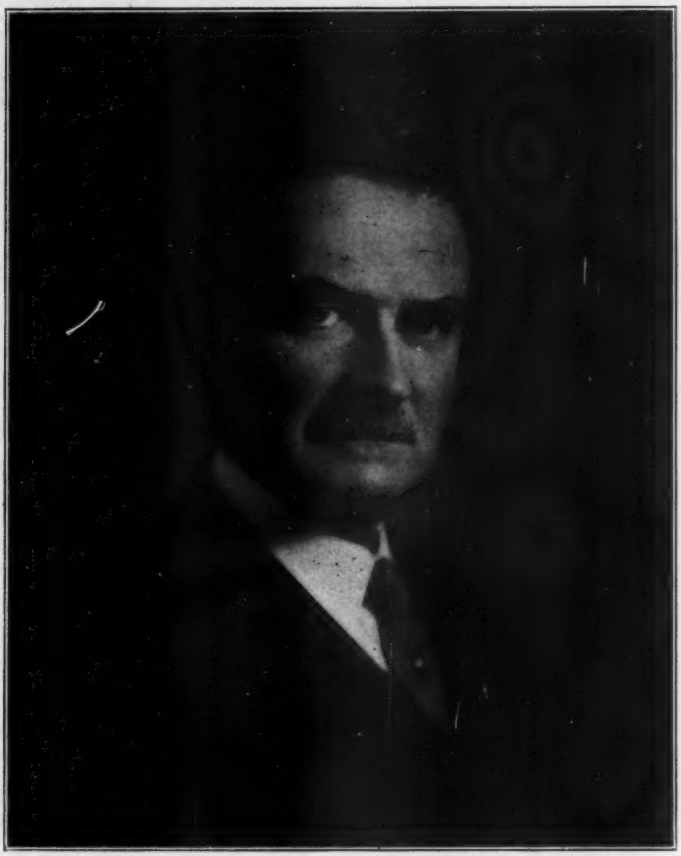

W. B. DUNNING, D.D.S., New York, N. Y.
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ANATOMY OF THE MOUTH IN RELATION TO COMPLETE DENTURES

By LINDEN F. EDWARDS,* Ph.D., and CARL O. BOUCHER,† D.D.S., Columbus, Ohio

THE primary objective of this paper is to correlate the anatomy of the mouth with prosthetic dentistry. The point of view adopted is that of the dentist who wishes to find out what anatomic structures lie underneath the dentures that he constructs. Since the success of complete dentures depends largely on the relation of the dentures to the anatomic structures which support and limit them, familiarity with the location and character of these structures is essential. This study was undertaken (1) to find out what anatomic structures in the edentulous mouth provide good denture bearing areas, (2) to determine what structures limit the periphery of the dentures, (3) to learn what structures permit additional pressure, (4) to ascertain what structures or areas require relief, and (5) to correlate the anatomic structures of the mouth with the impressions or landmarks produced on the dentures.

The method of approach is based on the traditional methods of teaching; namely (1) a study of the osseous structures involved, (2) dissection of the soft structures involved, (3) identification of corresponding structures in the mouth of the patient and (4) location of the impressions produced by these structures on the completed dentures.

The dissection material utilized in this study consisted of heads which were first frozen, then sawed into sections by means of a band saw, through various planes. The sections thus obtained were carefully dissected with the view to preserving as nearly as possible the normal anatomic relations. One head was sectioned through the transverse axis at the level of the occlusal plane in order to expose the roof of the mouth as seen from below (Fig. 4) and the floor of the mouth as seen from above (Fig. 10). The lower jaw of this head was sectioned in the midsagittal plane, to divide it into

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*Department of Anatomy, Ohio State University.

†Division of Prosthesis, College of Dentistry, Ohio State University.

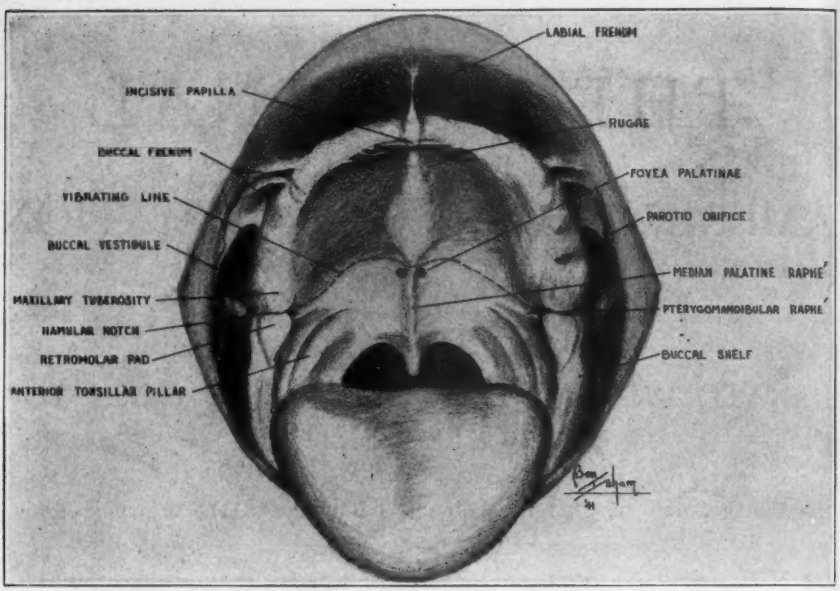

Fig. 1.—Oral cavity with tongue depressed; looking upward and backward.

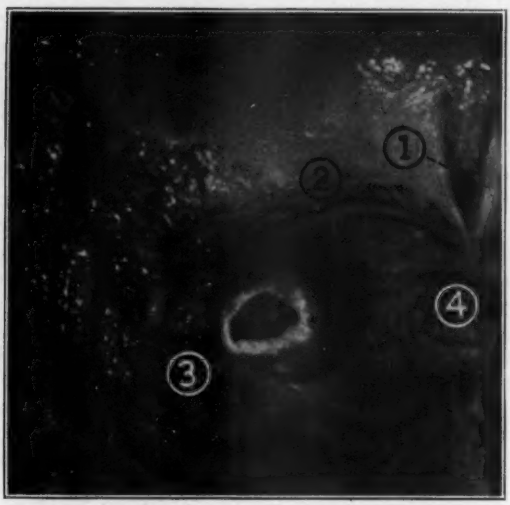

Fig. 2.—Dissection of upper buccolabial region. 1. Upper labial frenum. 2. Mucous membrane reflection area. 3. Buccal frenum (M. caninus). 4. Incisive papilla. The apparent absence of muscle in 1 and 2 is to be noted.

right (Fig. 26) and left (Fig. 10) halves. Another whole head was sectioned in the midsagittal plane (Fig. 22) to expose the structures as seen from the median view; that is, looking outward from the inside. The entire mandible was removed from

Fig. 4.—Dissection of roof of mouth. 1. Buccal frenum (M. caninus). 2. Buccal vestibule. 3. Parotid orifice. 4. Pterygomandibular raphe. 5. Buccinator muscle. 6. Maxillary tuberosity. 7. Hamular (pterygomaxillary) notch. 8. Hamulus. 9. Vibrating line. 10. Fovea palatina. 11. Median palatal raphe of soft palate. 12. Greater palatine foramen. 13. Anterior palatine vessels and nerve. 14. Palatal glands. 15. Median palatal raphe (hard palate). 16. Nasopalatine (incisive) vessels and nerve.

Fig. 3.—Superolateral aspect of upper denture. 1. Labial notch. 2. Buccal notch. 3. Maxillary tubercular fossa. 4. Pterygomaxillary postdam. 5. Palatal postdam. 6. Relief area. 7. Incisive fossa. 8. Masseter groove.

Fig. 5.—Dissection of buccopalatal region. 1. Parotid orifice. 2. Pterygomandibular raphe. 3. Buccinator muscle. 4. Vibrating line. 5. Fovea palatina. 6. Median palatal raphe. 7. Palatal gland. 8. Maxillary tuberosity. 9. Hamular (pterygomaxillary) notch. 10. Hamulus.

another head and the tongue was dissected away so as to expose the mylohyoid muscle and hyoid bone from above (Fig. 23).

Although most of the anatomic terms employed in this paper are adopted from the standard textbooks on human anatomy, we have taken the liberty to

Fig. 6.—Dissection of buccal vestibule. 1. Upper buccal mucous membrane reflection area. 2. Posterior boundary of vestibule. 3. Maxillary tuberosity. 4. Alveolar ridge.

Fig. 7.—Hard palate. 1. Maxillary tuberosity. 2. Hamular (pterygomaxillary) notch. 3. Hamulus. 4. Vibrating line (end of hard palate). 5. Greater palatine foramen. 6. Groove for anterior palatine vessels and nerve. 7. Median palatine suture. 8. Incisive foramen.

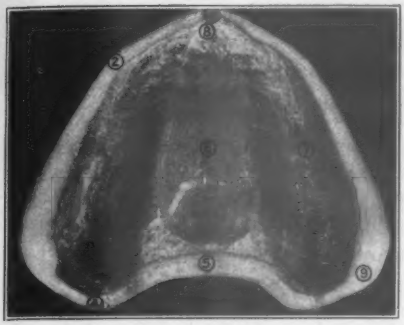

Fig. 8.—Superior aspect of upper denture. 1. Labial notch. 2. Buccal notch. 3. Maxillary tubercular fossa. 4. Pterygomaxillary postdam. 5. Palatal postdam. 6. Relief area. 7. Alveolar groove. 8. Incisive fossa. 9. Masseter groove.

ture employed is based on the fact (1) that an elevation in the mouth produces a depression on the denture base and (2) that the name of the landmark on the denture is derived from that of the anatomic structure which produces the impression. For example, the alveolar ridge in the mouth produces a depression, the alveolar groove, on the denture.

When the upper lip is everted (Fig. 1), the upper labial frenum can be observed in the midline as a fold of mucous membrane extending from the mucous lining of the lip to the labial surface of the alveolar gingiva. In the edentulous mouth, the frenum attaches near the crest of the ridge. A midsagittal section through the frenum (Fig. 22), as well

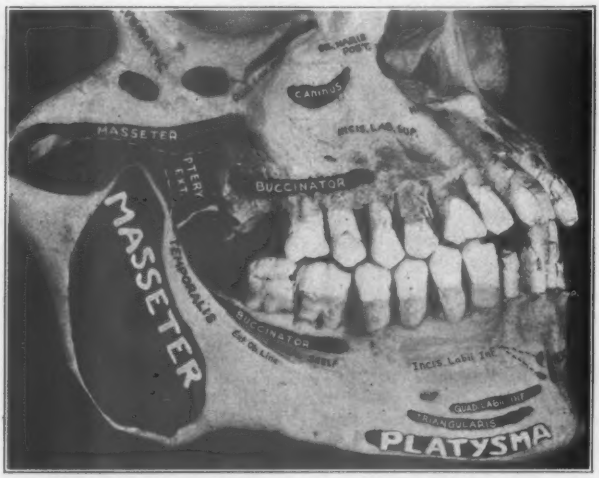

Fig. 9.—Lateral aspect of upper and lower jaws. Dil. naris post., dilator naris posterior. Ext. ob. line, external oblique line. Incis. lab. sup. and inf., incisivus labii superioris and inferioris. Ptery. ext., origin of lower head of external pterygoid muscle (lateral pterygoid plate). Quad. labii sup. and inf., quadratus labii superioris and inferioris.

apply terms to several anatomic structures which have not been described in these textbooks, but which have practical application to prosthetic dentistry. Moreover, in order to more closely relate the anatomic structures of the mouth with landmarks or impressions on the dentures, names have been coined for these landmarks. The principle of nomencla-

as dissection of it (Fig. 2), reveals that it does not contain a muscle and may therefore be safely cut in the event that it attaches too high on the alveolar ridge. On the denture (Fig. 3), it produces a well-defined notch, the labial notch.

On each side of the upper labial frenum is the labial mucous membrane reflection area (Fig. 1), which likewise

contains no muscle (Fig. 2). On the denture (Figs. 3 and 8) can be seen the contour of the labial flange produced by reflection of the mucous membrane. The distal extent of the labial reflection is marked by the upper buccal frenum (Fig. 1), which is a fold (or folds) of mucous membrane variable in size and position, extending from the buccolabial mucous membrane reflection area to the alveolar gingiva, usually in the cuspid region. It overlies the caninus (levator anguli oris) muscle (Figs. 2 and 4). On the denture (Figs. 3 and 8), it produces the buccal notch.

Distally from the upper buccal frenum is the buccal mucous membrane reflection area (Figs. 1 and 6). The space bounded externally by the cheek and internally by the alveolar gingiva (and the teeth in the dentulous mouth) is the buccal vestibule (Figs. 1, 4 and 6). In the cheek opposite the region of the upper second molar is the orifice of the parotid (Stenson's) duct (Figs. 1, 4 and 5). Under the mucous membrane of the cheek lies the buccinator muscle, the point of attachment of which to the alveolar process of the maxilla in the molar region is indicated in Figure 9. Its attachment to the pterygomandibular raphe and the direction of its fibers are shown in Figures 4 and 5. The direction of its fibers, which is downward and forward, indicates its lines of action and limits the height and thickness of the buccal flange of the denture (Figs. 3 and 8). In order to secure maximum retention of the denture, the buccal flange should completely fill the buccal vestibule. Care should be exercised not to overfill, since the buccinator muscle works around the flange and its action may be interfered with.

On the distal end of the upper alveolar ridge is the maxillary tuberosity, distally from which is the hamular (pterygomaxillary) notch bounded posteriorly by the pterygoid hamulus (Figs. 1, 4-7). The notch does not contain any muscles or ligaments to interfere with the addition of pressure for obtaining a seal so that a postdam bead may be safely located at this point. On the denture (Figs. 3 and 8), the maxillary tuberosity produces a depression, the maxillary tubercular fossa, distally from which is the pterygomaxillary portion of the postdam bead that passes through the hamular notch.

In the posterior portion of the roof of the mouth is the vibrating line (Fig. 1), which marks the junction of the soft palate with the posterior border of the hard palate (Figs. 4, 5 and 7), and which can be located by determining the place where the soft palate becomes movable.

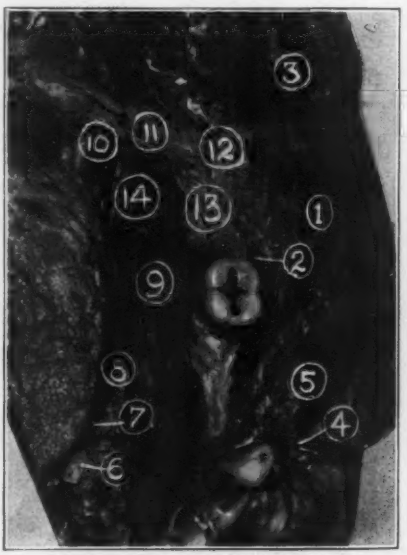

Fig. 10.—Dissection of buccolingual region of lower jaw. 1. Buccinator muscle. 2. External oblique line. 3. Masseter muscle. 4. Mental vessels and nerve. 5. Lower buccal frenum (M. triangularis). 6. Submaxillary caruncle. 7. Submaxillary (Wharton's) duct. 8. Sublingual gland. 9. Mylohyoid muscle. 10. Glossopalatine arch (anterior tonsillar pillar). 11. Retromylohyoid curtain (superior pharyngeal constrictor muscle). 12. Pterygomandibular raphe. 13. Retromolar gland. 14. Lingual nerve.

It varies in its relation to the hard palate in different mouths in accordance with the anterior-posterior contour of the soft palate. The foveae palatinae (Figs. 1, 4 and 5) appear as two dimple-like indentations in the soft palate, one on each side of the midline just posteriorly from the vibrating line. The direction of the muscle fibers in the soft palate and their fusion at the midline to form the median palatine raphe are shown in Figures 4 and 5. On the denture (Figs. 3 and 8) is indicated the palatal portion of the postdam bead, which should extend across the palate at the junction of the movable and immovable tissues.

The greater palatine foramen (Figs. 4 and 7) is located lingually from the maxillary tuberosity and anteriorly from the pterygoid hamulus in the posterolateral angle of the hard palate. It transmits the anterior palatine nerve and descending palatine vessels (Fig. 4). In their course medially and forward, they follow a groove (Fig. 7), which serves to protect them. Moreover, they are well protected by overlying thick glandular tissue, the palatal glands (Figs. 4 and 5), so that no relief is necessary in this area unless a highly resistant impression material is used.

In the midline of the hard palate (Fig. 7) is the median palatine suture, at the anterior end of which is the incisive foramen for the nasopalatine vessels and nerves. The suture is marked in the mouth (Figs. 1 and 4) by the median palatine raphe, and the incisive fora-

Fig. 11.—Lateral view of lower jaw, showing mandibular attachment of buccinator muscle. 1. Buccinator muscle. 2. External oblique line. 3. Mental vessels and nerve. 4. M. triangularis. 5. Masseter muscle.

Fig. 12.—Anterior aspect of edentulous mandible. 1. Coronoid process. 2. Condyloid process. 3. Retromolar sulcus. 4. External oblique line. 5. Mental foramen. 6. Lingual tuberosity.

Fig. 13.—Inferior aspect of lower denture. 1. Alveolar groove. 2. External oblique groove. 3. Buccal notch. 4. Lingual notch. 5. Lingual tubercular fossa. 6. Retromylohyoid eminence. 7. Retromolar fossa.

men, by a projection, the incisive papilla, which serves to protect the underlying vessels and nerve. In the edentulous mouth, the papilla may lie almost on the crest of the ridge and will require relief. Moreover, the median palatine suture is thinly covered with mucoperiosteum and likewise must be relieved. On the denture (Figs. 3 and 8) is shown

Fig. 14.—Dissection of lower buccal region. 1. Buccinator muscle. 2. External oblique line. 3. Mental vessels and nerve. 4. Lower buccal frenum (M. triangularis). 5. Temporal tendon. 6. Retromolar gland.

the relief area, which extends forward to include a depression, the incisive fossa, which protects the papilla and the underlying vessels and nerve. The width of the relief area depends on the contour of the underlying bony structure, while the thickness of the relief area varies with the hardness of the tissue in this area in comparison with that of the alveolar ridge.

The external oblique line of the mandible and the anterior border of the ramus can be palpated on the lower jaw (Fig. 1) distobuccally from the alveolar ridge. As can be seen on the mandible (Fig. 9), the more or less sharp anterior border of the ramus is continuous with the external oblique line, which, in the region of the molars, forms a distinct ridge. The changed relationship of the oblique line with the alveolar ridge when the teeth are lost is shown on the edentulous mandible (Fig. 12). On the denture (Figs. 13, 16 and 27), it produces the external oblique groove. The buccinator muscle overlies the external oblique line and the anterior border of the masseter muscle lies distobuccally from it as shown in Figures 10, 11, 14 and 24. In some mouths, the masseter crowds the buccinator forward against the denture and an indentation, the masseter groove (Figs. 3 and 8), results.

The buccinator muscle is attached to the mandible at the buccal shelf (Fig. 9), which is bounded externally by the external oblique line and internally by the crest of the alveolar ridge. The apparent flattening of the buccal shelf when the molar teeth are lost is shown on the edentulous mandible (Fig. 12). The buccal flange of the lower denture (Figs. 13, 16 and 27) rests upon the attachment of the buccinator muscle and should extend into the lower portion of the buccal vestibule (Figs. 1 and 6) as far as the tissues will permit.

The mental foramen, which transmits the mental vessels and nerve (Figs. 10 and 14), lies nearer the crest of the alveolar ridge on the edentulous mandible (Fig. 12) than on the dentulous one (Fig. 9). The position of the foramen in the edentulous mouth (Fig. 15) can be located by feeling the pulsations of

the mental artery where it emerges from the foramen. In cases of extensive resorption of the ridge, the denture may impinge upon the vessels and nerve and will require some relief.

Mesially from the mental foramen in the mouth (Fig. 15), a fold, or folds, of mucous membrane can be seen, the lower buccal frenum, which is variable in size and position, extending from the reflected buccolabial mucous membrane to the alveolar gingiva, usually in the region of the lower cuspid. Dissection of this frenum (Figs. 10 and 14) reveals the underlying triangularis (depressor anguli oris) muscle. On the denture may be lowered by an incision. On the denture (Figs. 13, 16 and 27), it produces the labial notch. When the ridge is low in this region, the length of the labial flange of the denture (Figs. 13, 16 and 27) is limited by the mucous membrane reflection.

When the tip of the tongue is elevated to the roof of the mouth, the lingual frenum, (Fig. 15) can be observed as a fold of mucous membrane extending from the floor of the mouth along the midline to the under surface of the tongue. It overlies the genioglossus muscle (Fig. 17), which takes origin from the superior genial spine of the mandible

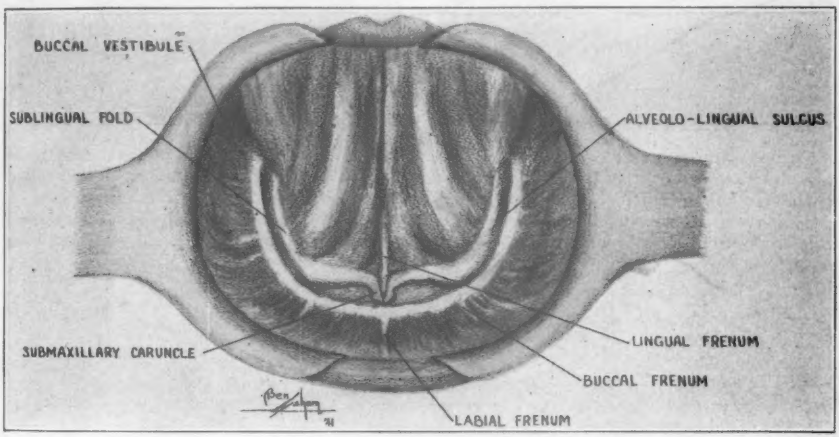

Fig. 15.—Oral cavity with tongue elevated; looking downward.

(Figs. 13, 16 and 27), it produces a groove, the buccal notch.

When the lower lip is everted (Fig. 15), the lower labial frenum is exposed as a fold of mucous membrane extending from the mucous membrane of the lip along the midline to the labial surface of the alveolar gingiva. In the edentulous mouth, it is attached near the crest of the alveolar ridge. As can be seen in the midsagittal section (Fig. 22) and the dissection (Fig. 17), it does not contain any muscle, so that, in the event its attachment is too high on the ridge, it (Fig. 21). Intervening between the spine and lingual frenum is the supragenial space (Fig. 17), which is filled with areolar tissue. In the edentulous mandible (Fig. 18), the spine lies nearer the crest of the ridge. The lingual frenum and floor of the mouth in this region are elevated when the tongue is thrust upward and backward, and as a result, the length of the lingual flange of the denture (Figs. 13, 16 and 27) from the first bicuspid to the first bicuspid is limited.

The submaxillary caruncle (Figs. 10, 15, 19 and 24), which marks the orifice

of the submaxillary (Wharton's) duct, lies on each side of the lingual frenum. Extending distally from the caruncle on the under surface of the sides of the tongue is a fold of mucous membrane, the sublingual fold (Figs. 15 and 26), which is produced by the underlying submaxillary duct and the sublingual gland

Fig. 16.—Superolateral aspect of lower denture. 1. External oblique groove. 2. Buccal notch. 3. Labial notch. 4. Lingual notch. 5. Mylohyoid groove. 6. Lingual tubercular fossa. 7. Retromylohyoid eminence. 8. Retromolar fossa.

The mylohyoid muscle, which forms the muscular floor of the mouth, arises from the mylohyoid ridge on the mandible (Figs. 18 and 21). The ridge terminates distally in a slight prominence, the lingual tuberosity, situated lingually from the region of the third molar. When the teeth are lost, the ridge and tuberosity lie nearer the crest of the alveolar ridge (Fig. 21) than in the dentulous mouth (Fig. 18), and their contact with the lingual flange of the

Fig. 18.—Medial aspect of edentulous mandible. 1. Genial (mental) spine. 2. Mylohyoid ridge (note proximity to crest of ridge). 3. Lingual tuberosity (note position with respect to 4). 4. Retromylohyoid area. 5. Mandibular foramen.

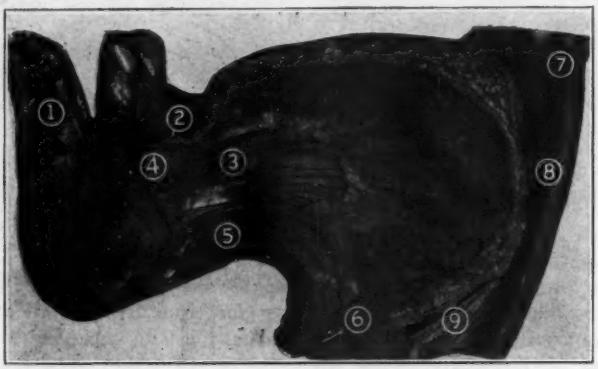

Fig. 17.—Midsagittal section of lower jaw. 1. Labial frenum. 2. Lingual frenum. 3. Genioglossal muscle. 4. Supragenial space. 5. Geniohyoid muscle. 6. Hyoid bone. 7. Posterior tonsillar pillar. 8. Oral pharynx. 9. Epiglottis.

(Figs. 10, 19 and 24). The space situated between the tongue internally and the mandible externally is the alveololingual sulcus (Fig. 26).

lower denture produces on it the mylohyoid groove and lingual tubercular fossa (Figs. 13, 16 and 27).

The attachment of the mylohyoid

muscle to the mylohyoid ridge is shown from above in Figures 10, 19, 22, 23 and 24; from below in Figure 20, and from behind in Figure 25. It can be seen from these figures and as indicated by lines in Figure 21 that the direction of the fibers of this muscle is almost horizontally

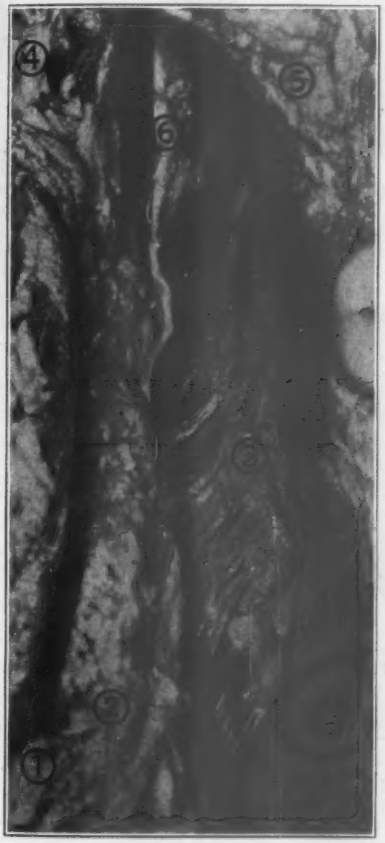

Fig. 19.—Dissection of alveololingual sulcus. 1. Submaxillary caruncle. 2. Sublingual gland. 3. Mylohyoid muscle. 4. Anterior tonsillar pillar (glossopalatine arch). 5. Retromolar pad. 6. Lingual nerve.

mediad in front of the hyoid, where they join those of the opposite side at the midline to form a raphe; whereas, at the level of the hyoid, they pass almost vertically downward to insert themselves into the hyoid. As is shown in Figures 21 and 22, the most distal point of attachment of the mylohyoid is not at the distal end of the ridge, that is at the lingual tuberosity, but about 1 cm.

Fig. 20.—Inferior aspect of floor of mouth. 1. Mylohyoid muscle. 2. Anterior belly of digastric muscle. 3. Masseter muscle. 4. Internal pterygoid muscle. 5. Retromylohyoid curtain.

distally from the latter on the medial aspect of the ramus. When viewed from behind (Fig. 25), the posterior margin

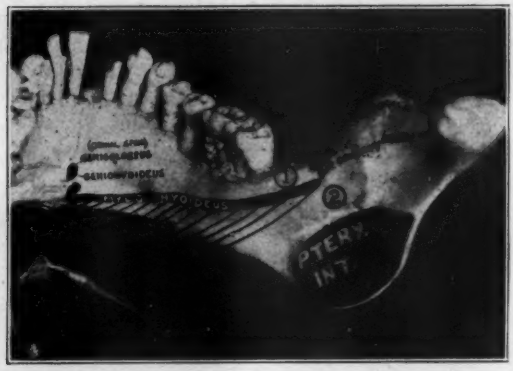

Fig. 21.—Medial aspect of mandible, showing position of hyoid bone and direction of fibers of mylohyoid muscle from mandible to hyoid. 1. Lingual tuberosity. 2. Retromylohyoid area. 3. Hyoid bone. Ptery. Int., point of insertion of internal pterygoid. Ptery. Ex., point of insertion of external pterygoid. Sup. Const., point of attachment of superior pharyngeal constrictor muscle and pterygomandibular raphe.

Fig. 22.—Midsagittal section of jaws with tongue removed. 1. Upper labial frenum. 2. Lower labial frenum. 3. Mylohyoid muscle. 4. Lingual tuberosity. 5. Retromylohyoid area. 6. Fossa for sublingual gland.

of the mylohyoid follows a curved, draped line, when relaxed. When it contracts to elevate the floor of the mouth, it follows a straight line. The length and direction of the posterior fibers of this muscle are an important factor in de-

termining the length and angle of the lingual flange of the lower denture. On the denture (Figs. 13, 16 and 27), it can be seen that (1) the lingual flange slopes toward the tongue in order to permit normal action of the mylohyoid on the floor of the mouth and (2) the relative length of the lingual flange distally as compared with its length anteriorly is greater, owing to the changed length and direction of the mylohyoid fibers in the two regions.

The retromylohyoid area (Figs. 18, 21 and 22) is situated on the medial aspect of the ramus of the mandible distally from the lingual tuberosity, anteriorly from the mandibular foramen and anterosuperiorly from the mylohyoid groove. The retromylohyoid space lies at the distal end of the alveololingual sulcus (Fig. 26) and is bounded as follows (Figs. 10, 19 and 24): medially by the anterior tonsillar pillar (glossopalatine arch); posteriorly by the retromylohyoid curtain of tissue which is formed by the superior pharyngeal constrictor muscle covered in front with mucous membrane; laterally by the retromylohyoid area of the mandible and by the pterygomandibular raphe; anterolaterally by the lingual tuberosity, and below by the posterior border of the mylohyoid muscle covered above with mucous membrane. The lingual nerve lies in close relation to the space, as shown in Figures 10, 19, 24 and 25. As seen from behind (Fig. 25), the retromylohyoid curtain of tissue lies distally from the lingual tuberosity and above the lingual nerve and the posterior border of the mylohyoid muscle. Since the superior pharyngeal constrictor is situated in the upper portion of the retromylohyoid curtain, additional pressure will be tolerated here. The distal end of the lingual flange of the denture (Figs. 13, 16 and 27) should drop downward and distally into the retromylohyoid space, and if it does so, a prominence, the retromylohyoid eminence, will be produced on the denture.

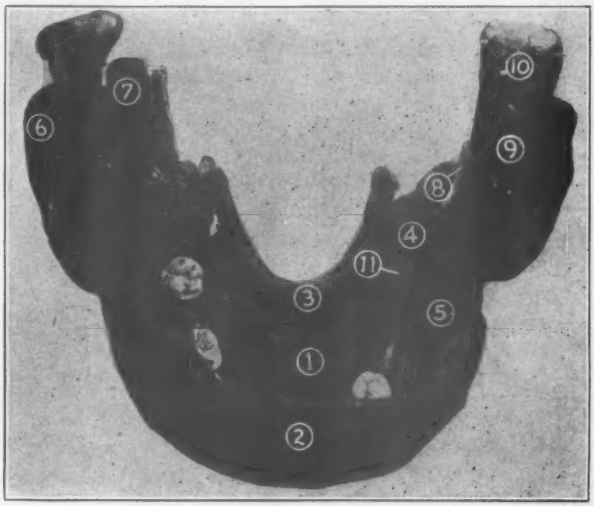

Fig. 23.—Superior aspect of lower jaw with tongue removed. 1. Mylohyoid muscle. 2. Upper lip. 3. Hyoid bone. 4. Retromolar pad. 5. Buccal vestibule. 6. Masseter muscle. 7. Internal pterygoid muscle. 8. Lingual nerve. 9. Temporal muscle. 10. Condyloid process. 11. Lingual tuberosity.

On the distal end of the lower alveolar ridge in the mouth (Fig. 1), a pear-shaped area of tissue, the retromolar pad, can be observed. Dissection of this pad (Figs. 10, 14 and 24) reveals the following components: (1) the retromolar gland, which is histologically similar to and continuous with the palatal glands; (2) the pterygomandibular raphe, which extends from the pterygoid hamulus (Fig. 7) superiorly to the alveolar ridge, inferiorly under the retromolar gland; (3) the buccinator muscle, which at this point arises from the raphe, and (4) the temporal tendon, which underlies the buccinator. These structures make a direct connection across the distal end of the ridge. The temporal tendon at this point occupies the retromolar sulcus of the mandible (Fig. 12), and its relation to the buccinator muscle, which overlies it, and to the ramus of the mandible is shown in Figures 24 and 26. Pressure in this area is limited owing to the activity of the muscles. However, the distal end of the lower denture should cover the retromolar pad, the retromolar fossa resulting on the denture (Fig. 27).

Fig. 24.—Dissection of retromylohyoid space as seen from above. 1. Buccinator muscle. 2. Masseter muscle. 3. Internal pterygoid muscle. 4. Anterior tonsillar pillar (glossopalatine arch). 5. Retromylohyoid curtain (superior pharyngeal constrictor muscle). 6. Retromolar gland (pterygomandibular raphe). 7. Temporal tendon. 8. Lingual nerve. 9. Mylohyoid muscle. 10. Sublingual gland. 11. Submaxillary caruncle.

Fig. 25.—Retromylohyoid space as seen from below and behind. 1. Superior pharyngeal constrictor muscle. 2. Lingual nerve. 3. Retromylohyoid curtain. 4. Posterior margin of mylohyoid muscle. 5. Internal pterygoid muscle (insertion). 6. Masseter muscle (insertion at angle). 7. Anterior belly of digastric muscle.

SUMMARY

The primary objectives of this study were (1) to find out (a) what anatomic structures in the edentulous mouth provide denture bearing areas, (b) what structures limit the periphery of the dentures and (c) what structures permit additional pressure, and (2) to correlate the anatomic structures with the impressions or landmarks produced on the dentures.

The method of approach was (1)

study of the bony structures involved and the soft structures involved, as determined by dissection; (2) examination of the edentulous mouth of the patient for the purpose of locating these osseous and soft structures, and (3) identification of the impressions or landmarks produced by these structures in the dentures.

In order to more closely relate the anatomy of the mouth with prosthetic dentistry, names are suggested (1) for related anatomic structures which are not described in the standard textbooks

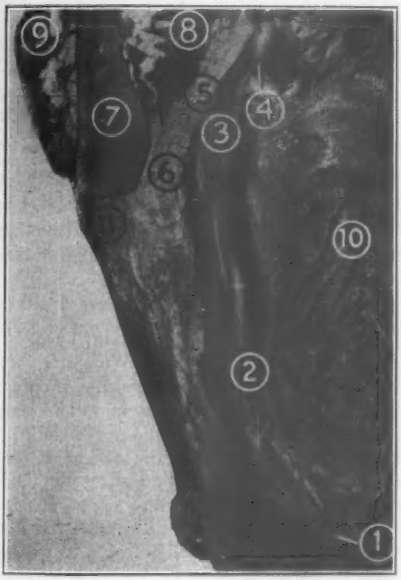

Fig. 26.—Superior aspect of alveololingual sulcus. 1. Submaxillary caruncle. 2. Sublingual fold. 3. Retromylohyoid space. 4. Anterior tonsillar pillar. 5. Retromylohyoid curtain. 6. Retromolar gland (pterygomandibular raphe). 7. Ramus of mandible. 8. Internal pterygoid muscle. 9. Masseter muscle. 10. Dorsum of tongue. 11. Buccinator muscle.

of anatomy and (2) for the characteristic landmarks or impressions produced on the dentures by the anatomic structures.

The terms applied to related anatomic structures, including those coined in this study, as well as those previously described, and to the respective landmarks on the dentures, are as follows:

ANATOMIC STRUCTURES

Labial frenula
Buccal frenula
Maxillary tuberosity
Anterior border of masseter muscle
Hamular (pterygomaxillary) notch
Vibrating line
Incisive papilla
External oblique line of mandible
Mylohyoid ridge of mandible
Lingual tuberosity
Postmylohyoid space
Retromolar pad

DENTURE LANDMARKS

Labial notches

Fig. 27.—Inferior aspect of lower denture. 1. Alveolar groove. 2. External oblique groove. 3. Buccal notch. 4. Labial notch. 5. Lingual notch. 6. Mylohyoid groove. 7. Lingual tubercular fossa. 8. Retromylohyoid eminence. 9. Retromolar sulcus.

Buccal notches
Maxillary tubercular fossa
Masseter groove
Pterygomaxillary postdam
Palatal postdam
Incisive fossa
External oblique groove
Mylohyoid groove
Lingual tubercular depression
Postmylohyoid eminence
Retromolar fossa

PROPHYLACTIC USE OF SULFAPYRIDINE IN PATIENTS SUSCEPTIBLE TO SUBACUTE BACTERIAL ENDOCARDITIS FOLLOWING DENTAL SURGICAL PROCEDURES

PRELIMINARY REPORT

By Edward Budnitz,* M.D., Worcester, Mass.; Abraham Nizel,† D.M.D., Camp Edwards, Mass., and Leo Berg,† D.M.D., Boston, Mass.

THE results of the use of the sulfonamides in subacute bacterial endocarditis have been disappointing. Even the more enthusiastic supporters of the use of these drugs alone or in combination with heparin or fever therapy admit a mortality rate of at least 90 per cent. The purpose of this paper is to suggest a prophylactic rather than a curative rôle for sulfapyradine following dental surgical procedure in patients who may be susceptible to subacute bacterial endocarditis.

INCIDENCE OF SUBACUTE BACTERIAL ENDOCARDITIS FOLLOWING DENTAL SURGICAL PROCEDURES

Subacute bacterial endocarditis following tooth extraction has been reported by Rushton[1] (four cases), Feldman and Trace[2] (five cases), Bernstein[3] (one case), Weiss[4] (ten cases), Elliott[5] (thirteen cases), Sale[6] (three cases) and many others. Probably many more cases would be noted if, in securing medical histories, information pertinent to recent dental surgical procedure was obtained before symptoms of endocarditis arose. Kelson, in the study of the records of 250 cases of subacute bacterial endocarditis at the Massachusetts General Hospital, found a 10 per cent incidence of previous recent dental surgical operations. However, since then, in a series of 500 cases in which he investigated the dental history, the incidence rose to about 25 per cent. The evidence points, therefore, to a definite etiologic rôle for dental surgical procedure in many cases of subacute bacterial endocarditis.

CASE REPORT

History.—D. M., a white man, aged 25, married, was admitted to the Worcester City Hospital, December 7, 1939, because of chills, fever, sweats, weakness, loss in weight and pallor of four months' duration. He had had a "heart murmur" since the age of 2, discovered by a physician who was treating him for measles. He had, however, been in perfect health and had led an unrestricted life until five months before admission, when he had two "abscessed" teeth extracted. Thereafter, he recalled chills, fever and general malaise, requiring him to remain in bed for two days, after which he recovered partially, remaining fairly well until about three weeks before the symptoms appeared which led ultimately to his entry in the hospital. He had first sought help at another hospital, where he remained six weeks, but from which he had been discharged unimproved. Before admission to the Worcester City Hospital, there had been a period of home care, during which he became worse.

Physical Examination.—The patient was

From the cardiac and dental clinics, Worcester City Hospital.

Read before the Worcester County Dental Society, Worcester, Mass., May 7, 1941.

*Assistant in medicine, Harvard Medical School; assistant visiting physician, Worcester City Hospital, and assistant cardiologist, outpatient department, Worcester City Hospital.

†Formerly dental intern, Worcester City Hospital.

thin and pale. He lay flat in bed, perspiring and complaining of sharp stabbing pains low in the left side of the chest aggravated by deep respiration and cough. The temperature was 104° F., respiration rate 28, pulse 110. The heart was enlarged to the left, with sounds of fair quality, regular rhythm and a rate of 110. A harsh systolic murmur was heard over the base, maximally at the third left interspace, where a definite systolic thrill was felt. The blood pressure was 100/60. Examination of the lungs revealed a pleural friction rub at the left base and axilla, where respiratory movements were definitely limited. No petechiae were present. The spleen, liver and kidneys were not palpable. Early clubbing of the fingers was present.

Laboratory Data.—The hemoglobin was 52 (Sahli); red cell count, 2,580,000; white cell count, 14,300, with 80 per cent neutrophils. The urine showed a trace of albumin and sediment with occasional casts and red blood cells. The blood sugar was 90, the nonprotein nitrogen 32. A blood culture showed no growth. An electrocardiogram was not remarkable.

Clinical Course.—In spite of treatment with combined sulfapyridine and heparin, sulfamethylthiazole, repeated blood transfusions and other supportive measures, the patient failed slowly. The temperature ranged from 99 to 104° F. and was never entirely normal for more than forty-eight hours. Repeated blood cultures were negative. At one time, petechiae were seen on the soft palate. The spleen became enlarged during observation. A peripheral neuritis developed after the course of sulfamethylthiazole. The patient had several other periods of chest pain, with clinical and x-ray evidence of pulmonary infarction. On the two hundred and twenty-sixth day in hospital, he died.

Clinical Diagnoses.—The diagnosis was congenital heart disease with interventricular septal defect, subacute bacterial endocarditis and peripheral neuritis.

Postmortem Findings.—Bacterial vegetations (from which *Streptococcus viridans* was cultured) were found on the tricuspid and pulmonic valves. Also present were an interventricular septal defect, multiple fresh and healed pulmonary infarcts and focal embolic glomerulonephritis, bronchopneumonia and splenic infarcts.

TRANSIENT STREPTOCOCCUS VIRIDANS BACTEREMIA FOLLOWING DENTAL SURGICAL PROCEDURE

Transient streptococcus bacteremia following the removal of teeth has been definitely demonstrated by Okell and Elliott,[7] who found a transitory bacteremia in 61 per cent of 138 cases, in which blood cultures were taken immediately after dental surgical procedure. Most of the positive blood cultures were those taken within ten minutes after tooth extraction, and usually, in from thirty to sixty minutes later, the cultures were negative. These findings were corroborated by Palmer and Kempf,[8] who showed that 17 per cent of a group of eighty-two patients who had not more than two teeth extracted had a transient *Streptococcus viridans* bacteremia, whether or not oral sepsis was present. In a later work, Elliott[5] confirmed his earlier results and found a 75 per cent incidence of transient bacteremia (mostly *Streptococcus viridans*) associated with oral sepsis. In fact, the trauma of dental surgery was not necessary to produce this condition, a mere "rocking" of a tooth in an infected gum producing a bacteremia.

These cases of transient bacteremia have no or very little permanent effect on persons in good health and without heart disease. However, if a valvular or congenital cardiac defect exists, the soil is fertile for the implantation and superposition of the bacteria, and subacute bacterial endocarditis may result. In this work, we have attempted to prevent or immediately inhibit the transient bacteremia by the use of sulfapyridine in those patients who require oral surgical measures and who are known to be susceptible to subacute bacterial endocarditis. Libman[9] and others have shown that subacute bacterial endocarditis nearly always occurs in the presence of a previously injured heart valve, resulting from rheumatic infection or in the presence

of a congenital defect. It is these patients who require protection.

METHOD AND RESULTS OF PROPHYLACTIC USE OF SULFAPYRIDINE

During the past year and a half, the following routine was adopted by the cardiac and dental clinics at the Worcester City Hospital in an attempt to prove the value of the prophylactic use of sulfapyridine in the prevention of subacute bacterial endocarditis in patients with valvular and congenital heart disease requiring tooth extraction. Each patient was selected after consultation between the cardiac and dental clinics. These patients were given sulfapyridine 1.0 gm. initially and then 0.5 gm. every four hours (except during sleep), for a period of six or seven consecutive days. The necessary dental surgical measures were carried out on the third or fourth day. Immediately after the tooth extraction, a blood culture was made and another was made twenty to thirty minutes later. (The culture medium for all except the first few cases contained para-aminobenzoic acid to counteract the inhibitory action of the sulfonamides on growth of streptococcus.) We now have recorded twenty-seven cases of valvular and congenital heart disease in which this prophylactic régime was adopted, and there have been no major untoward reactions, no postoperative positive blood cultures or any cases of subacute bacterial endocarditis. (Fifteen other patients received sulfapyridine prophylactically, but these cases are not included because blood culture studies were not made. Also, none of these patients developed subacute bacterial endocarditis.)

COMMENT

The results in our twenty-seven cases suggest that sulfapyridine may have some value in the prevention of subacute bacterial endocarditis occurring after dental surgical procedure. Our series is small, but the fact that no *Streptococcus viridans* bacteremia occurred seems significant.

The rationale for this prophylactic therapy is as follows: (a) we know the type of cardiac patient who may develop subacute bacterial endocarditis; (b) we know that there is a large incidence of subacute bacterial endocarditis following dental surgical measures; (c) we know that transient *Streptococcus viridans* bacteremia occurs in a large percentage of cases after tooth extraction; (d) we know, furthermore, that sulfapyridine is an excellent bacteriostatic and bactericidal drug against *Streptococcus viridans,* but, like all the sulfonamides, its action is most effective during the "spreading," dissemination or bloodstream stage of the disease. Once localization has occurred as in postpneumonic empyema, a mastoid abscess or a firmly implanted subacute bacterial endocarditis, the effectiveness of these chemicals is greatly reduced.

With this knowledge, we carried on this study, but statistical proof that we have prevented subacute bacterial endocarditis will not be available until many additional cases have been recorded and observed. If these prophylactic procedures prove to be of value, they can, of course, be applied to cardiac patients requiring any type of surgical procedure in the presence of sepsis.

SUMMARY

1. Sulfapyridine was used prophylactically for twenty-seven patients with valvular or congenital heart disease requiring extraction of one or more infected teeth.

2. No major untoward reactions to the use of the drug occurred.

3. No transient *Streptococcus viridans* bacteremia resulted.

4. No cases of subacute bacterial endocarditis developed.

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AN APPROACH TO A RATIONAL STUDY AND TREATMENT OF TEMPOROMANDIBULAR JOINT PROBLEMS

By LOUIS S. BLOCK, D.D.S., and ELAM HARRIS, D.D.S., Louisville, Ky.

THE subject of diseases of the temporomandibular joint and their treatment is coming more and more to the attention of the dental profession, the medical profession and the public. The temporomandibular joint is being studied from the standpoint of (1) anatomy of the normal joint; (2) prevention of abnormalities or maintenance of proper vertical dimension by (a) dental restorations, (b) balancing of occlusion in the natural teeth and (c) orthodontia; (3) pathologic changes in the joint due to abuses of the dental mechanism; (4) roentgenology of the joint in both normal and abnormal positions, and (5) treatment by dental correction.

With a few notable exceptions, the medical profession, as it becomes acquainted with the possibilities, is finding this subject a useful one in diagnosis and treatment of various complex and obscure types of neuralgia of the ear and face as well as the ear symptoms that so commonly accompany temporomandibular abnormalities.

We are going through a developmental period in temporomandibular joint pathology. Men thoroughly unqualified, except for being inspired at a beautiful motion picture demonstration of a reconstruction case or for taking a six-day "bite-opening" course are undertaking to reposition mandibles. Their sins will find them out. After a few experiences in explaining to their patients why some of the teeth are becoming tender and loose or are being intruded into their sockets, these operators will either discontinue such practices or make a serious effort to learn more about the subject.

For the past seven years, we have studied this subject jointly and separately, consulting each other on many cases, developing a technic, frequently disagreeing and frequently meeting with discouraging results. We have been striving constantly to eliminate the air of mystery

Read at the Five State Post Graduate Clinic, Washington, D. C.

that has hovered about this subject. So many clinicians have presented their viewpoints in a vague manner or have implied that special equipment is necessary that many men have avoided even studying the subject.

THE BITE: WHEN AND WHEN NOT TO DISTURB THE EXISTING BITE

In the last few years, we have heard a great deal about bite opening, bite raising, rebuilding occlusal surfaces and establishing proper vertical dimension between the jaws.

To disturb or not to disturb the existing bite is a question that often confronts the dentist. It is just as important to know when to leave a condition alone as it is to know when to do something about it.

May we sound a note of warning and urge caution in disturbing bites. Also, we wish to go on record as condemning the practice of promiscuous bite opening, occlusal rebuilding and grinding occlusal surfaces. You will note the use of the word "promiscuous."

There are times when the removal of the appendix is essential. That such an operation is successful is no reason for the surgeon to go about performing appendectomies promiscuously. Instead, a careful and thorough examination should be made, and this should guide the surgeon in his decision. The same care should be exercised and the same procedure followed by the dentist when he is called upon to decide whether to disturb the existing bite. Like the surgeon, we should be able, by careful examination, to determine whether to operate. If the case is one demanding an operation, and we fail to recognize it, irreparable harm may result. On the other hand, if it is a case that is better let alone, and we disturb the bite, we may likewise do harm. Thus, the importance of examination and diagnosis is obvious. This responsibility is the dentist's. It is his obligation alone, because no one else is qualified to do this particular work, and it would be cowardly for him to attempt to shirk this responsibility.

After many disappointments, mingled with some successes over a period of several years, we have arrived at the following simple rule for all cases in which the bite is involved: "Never disturb a bite unless you have to do so."

Certain of the conditions rendering it advisable to change the bite are: esthetic values; pathologic conditions, such as periodontitis; the functional requirements, and disturbances due to dislocation of the temporomandibular joint resulting from bite abnormalities.

Little will be said here about esthetic values, functional requirements or pathologic conditions. All dentists are familiar with cases in which loss of vertical dimension, permitting the nose and chin to approach each other, detracts greatly from the appearance. In such cases, we are frequently justified in changing the bite for esthetic reasons.

All are familiar with bites so close that it is impossible to make the necessary restorations without increasing the intermaxillary space and thereby providing room.

All are familiar with periodontal conditions that are, at least in part, caused or aggravated by the existing bite.

In many of these cases, the dentist is not only justified in altering the bite, but it is also his duty to do so.

It is important that we interest physicians in this work because, in most cases, patients suffering from a temporomandibular joint disturbance consult their physicians first, it never occurring to them that it could possibly be a dental problem. If the physician is not informed on this subject, the patient may never get to the dentist, the only person who might afford him relief. It is our duty to see that the physician familiarizes himself with this phase of dentistry. If we as dentists state that severe pain and serious disturbances may have their origin

in the temporomandibular joint, we must be able to back up the statement with sound, recognized anatomic reasons. We cannot expect to impress physicians with the importance of our work by simply making statements, however true they may be. We must present sound reasons as to why these statements are true. When we address medical men, we must explain why the temporomandibular joint may cause serious trouble, and we should back up our statements by standard texts on anatomy, not one, but several.

When the mandible is in normal relation to the maxillae, with the teeth closed in centric occlusion, the condyles of the mandible will be in normal position in the glenoid fossae, and all muscles affected by the position of the mandible, unless disturbed by other conditions, will function normally.

The teeth, either natural or artificial, determine the position of the mandible and its relation to the maxillae when the jaws are closed. Therefore, the position of the condyles in the glenoid fossae is determined by the teeth. If the teeth assure that the mandible is held in normal relation to the maxillae when the teeth are closed, the temporomandibular joints will be normal. Therefore, when the teeth do not hold the mandible in normal position, the temporomandibular joints will be abnormal; and disturbances resulting from failure of the teeth to hold the mandible in proper position when the jaws are closed at once become a dental problem.

There is no desire to encroach upon the field of the physician. Dentists have not entered this field from choice. Since the dentist is the only one who can correct the abnormalities to which we have just referred, and he alone can relieve whatever disturbances may arise from the abnormalities, he has no choice. He must recognize and assume this responsibility and cooperate fully with the medical men.

We would define the normal relation of the mandible to the maxillae, when the teeth are closed in centric position, as that relation in which an acceptable occlusion and vertical dimension exist while the condyles are in a normal position in the glenoid fossae. It is that position in which a normal temporomandibular articulation is associated with an acceptable occlusion and vertical dimension.

In describing the normal temporomandibular articulation, we can do no better than quote Goodfriend,[1] who says:

> The articular relationship with the teeth occluded is between the anterosuperior surface of the condyle and the inferoposterior surface of the articular eminence. . . . It is important to note that the condyle is not in contact with the fossa except at the lower part of its anterior wall, which is also the posterior wall of the articular eminence.

Let us check Goodfriend's statement with some standard texts on anatomy. Gray, describing the glenoid fossa, says: "The anterior part, formed by the squamous portion of the bone, is smooth, covered in the recent state by cartilage and articulates with the condyle of the lower jaw." Gray quotes Humphry as follows: "This part of the glenoid fossa is separated from the auditory process by the post glenoid process, the representative of a prominent tubercle which, in some of the mammalia, descends behind the condyle of the jaw, and prevents it being displaced backward during mastication." In their textbooks on anatomy, we find that Piersol, Morris and Cunningham are in accord with this statement by Gray. So we find that Goodfriend's definitions of the normal temporomandibular articulation are substantiated by four recognized texts on anatomy.

Let us keep in mind, then, that the normal articulation of the joint is in the anterior part of the fossa and never in the superior or posterior part. Since the teeth act as nature's "stop," to prevent the dislocation of the condyles upward

and backward, the loss of one or more teeth, the wearing away of the teeth or any other deviation of the teeth from normal may cause or permit a dislocation upward and backward. As the jaws are closed by the powerful muscles, the condyle moves upward and backward, and if the teeth do not stop the closure, the condyle will be dislocated upward and backward. If the condyle is dislocated anteriorly and slips over the articular eminence, we become greatly concerned and immediately set to work to reduce the dislocation, because the patient cannot close the mouth. We should be equally concerned about correcting a posterior-superior dislocation when serious and distressing symptoms are present.

The symptoms arising from posterior-superior and lateral dislocation of the joint or derangement of its ligaments or muscular attachments have been best described by Costen.[2] These symptoms are nearly always reflex, and, because of this fact, they are often misleading. They have led us away from the temporomandibular joint in our search for the causes, and until recently, this joint has received comparatively little attention in making diagnoses when the following symptoms occur:

1. Pain, dull type, within and about the ears.[2]

2. Tinnitus, usually "low buzz" in type, less often a snapping noise while chewing.[2]

3. Stopping or "stuffy" sensation in ears, marked about meal time.[2]

4. Mild catarrhal deafness, which is improved by inflation of the eustachian tubes.[2]

5. Dizzy spells, relieved by inflation of the eustachian tubes.[2]

6. Tenderness to palpation of temporomandibular joints.[2]

7. Typical sinus headaches after sinus or eye involvement has been corrected, or typical headache when the sinuses or eyes have been found to be negative[2]; also pain in the top of the head, behind the ear or at the base of the skull.

8. Traumatic, noisy, painful, limited or excessive movement of the temporomandibular articulation.[2]

9. Neuralgia.[2]

10. A burning or prickling sensation of the tongue, throat and side of the nose. Accompanying this sensation, a slight herpes of the affected part may be present.[2]

11. Eczema within the external ear.

12. Metallic taste.

13. Excessive wax accumulation in the external canal.

14. Dryness of the mouth due to disturbed function of the salivary glands.

A further study of the anatomy of the mandible and the temporomandibular joint, ligaments and muscles shows why these symptoms may arise from an abnormal joint and abnormal position of the mandible and why relief is had when these abnormalities are corrected, by restoring the teeth to normal function.

Certain reasons for maintaining the normal relation of the upper and lower jaws and protecting the posterior-superior part of the fossa from the powerful upward and backward thrusts of the condyle are: 1. The chorda[2] tympani nerve passes between the handle of the malleus and long process of the incus and emerges into the glenoid fossa through the glasserian or petrotympanic fissure, and it is here that the condyle may irritate it and also cause pressure on the anterior[3] tympanic artery, which accompanies the chorda tympani nerve through the glasserian fissure. Since the chorda[3] tympani nerve contains both motor and sensory fibers, it seems reasonable to suspect disturbance in the middle ear if the condyle irritates this nerve when it emerges through the glasserian fissure. Whether[3] this disturbance is produced directly through the sensory nerve fibers or through reflexes would not change the condition, the point of stimulation[3] remaining the same. Sensory nerve fibers[3] within blood vessel walls have been

demonstrated. The anterior tympanic artery supplies a large part of the tympanic membrane. It seems reasonable that irritation of this artery might cause disturbance of the middle ear. 2. The auriculotemporal[2] nerve passes close to the mesial side of the capsule and between the condyle and the tympanic plate, to distribute over the temporal region, extending to the vertex of the skull. 3. The very thin tympanic[2] plate separates the fossa from the middle ear. 4. The external auditory canal, a good part of which is cartilaginous, may sometimes be closed by pressure of the condyle. 5. An extremely thin[2] bone forms the roof of the fossa and separates it from the dura with its rich nerve supply. 6. The location of the eustachian[2] tube is such that overclosing of the jaw produces an excess of muscle and connective tissue, which bunches and causes pressure on the pharyngeal end of the eustachian tube, closing it and at the same time rendering the tensor veli palatini muscle powerless to function in opening the tube.

As we study further the anatomy of the mandible and temporomandibular joint, together with the ligaments, the muscles and the nerve and blood supply, and discover the many and intricate connections of the nerves, we are not surprised when Edwin P. Seaver, Jr., writes[4]:

> The temporomandibular joint occupies an important key position, due to its commanding location in nutrition and its intimate association and influence in the actions and reactions of the 5th, 7th, 8th, 9th, and 10th, cranial nerves and their higher centers of control. . . . There may be functional disturbances of the general nervous system through fear and pain, such that personality changes develop, even to neuroses and psychoneuroses. . . . A mechanical disturbance of the mandible and its joint causes a mechanical disturbance of the middle ear and inner ear, producing the symptoms of tinnitus, deafness and vertigo.

Seaver's conclusions are as follows:

> The explanation of the connection between the malocclusion of the temporomandibular joint and the inner ear symptom-complex is based upon a mechanical stimulation involving a neuro-muscular set-up in the middle ear, with a resultant mechanical disturbance in the inner ear, signifying a biologic protective reaction to a harmful stimulus. This external peripheral stimulus will vary in its effects according to the stage of irritation; the tinnitus is of muscular origin; the deafness is of the transmission type, and the vertigo is due to changes in the tension of the tympanic muscles, notably, the tensor tympani. The symptom-complex will be associated with other local and systemic factors and the whole picture will vary with the individual behavior.

Our interest in this particular subject developed several years ago, after restoration of the dental mechanism of several patients purely for dental reasons and the discovery that these patients not only obtained dental comfort, but also were relieved of some of the symptoms mentioned. We have offered what appear to be reasonable anatomic explanations as to how, through dental corrections, we are able to be of service to both the patient and the physician. The dentist should ask for a report from the physician before attempting any of these cases. His work should, when possible, be done in cooperation with the physician.

Abnormality of the temporomandibular articulation is determined by clinical and x-ray examination of the joint. Roentgenograms should be used freely to direct us in restoring the condyle to its proper position in the glenoid fossa. Sometimes the dental correction is simple, consisting, perhaps, of grinding a high cusp that throws the jaw off balance in chewing or in closing the teeth. Perhaps the patient will simply be instructed to sleep with the dentures in the mouth. Again, the treatment may call for new dentures, built to proper vertical length so that they will keep the jaw in its proper place. On the other hand, treatment may be long, tedious and expensive, as when every natural tooth must be restored to normal by the artificial supply-

ing of what has been lost through wear or decay. This work is of an exacting nature, requiring extreme care to determine precisely what should be done for each tooth. Then a high degree of skill and patience are required in carrying the work to completion. One of us (L. B.) was the first to make a distinction between positioning the mandible for relief of symptoms and the ordinary restoration or rebuilding of occlusal surfaces for masticatory purposes.

The upward and backward dislocation of the condyle may be unilateral or bilateral. When examination reveals a unilateral dislocation, the correction should be unilateral. This is a departure from the usual procedure, which has been to treat both sides, even though the deformity was only on one side. In practice, we have found that a unilateral dislocation, when treated as such, responds much more quickly and satisfactorily than when treated bilaterally.

For convenience, the following classification is offered: Class 1. No change in the surfaces of any of the bones entering into formation of the joint. Class 2. A change in the surface of one or more of the bones forming the joint, the change being a deposit, presumably calcific. (This deposit is usually found on the superior or anterosuperior surface of the condyle.) Class 3. A change in one or more surfaces, the change being an aseptic necrosis, usually of the condyle. We have roentgenograms showing almost complete destruction of the condyle.

By far the greatest number of cases are Class 1, with such symptoms as deafness, tinnitus, dizziness and glossodynia. The symptoms of Classes 2 and 3 are very similar: excruciating pain in and about the joints, radiating to the temporal, mastoid and cervical regions. The patient is unable to chew, owing to the extreme pain, and cannot lie on the affected side. When the teeth are made to hold the mandible in such position that irritation within the joint is removed, the pain ceases, sometimes instantly. The irritation being removed, the calcific deposit is resorbed or the necrotic condyle heals. I have seen no regeneration of the condyle, but a perfect healing of the stub of the condyle, a new cortical layer being quite plain in the roentgenogram.

We do have success with some cases of impaired hearing, and with some cases of tinnitus, but the percentage of success is much smaller than with the cases of neuralgia, the "typical sinus" cases referred to by Costen[2] and the "burning tongue, nose and throat" cases. In these cases, the percentage of success is high. In every full or partial denture case or reconstruction case, in fact in every mouth condition, there are three vital factors: (1) centric relation, (2) vertical dimension and (3) balanced occlusion. Most of our patients present mouths in miserable condition. For years, missing teeth have not been replaced, and periodontal conditions and malalinement have so distorted the dental mechanism that the patient is a dental cripple. Restoration of these mouths, whether by dentures or other means, requires knowledge of the normal and recognition of abnormal jaw relationships. Adequate study of centric relation, vertical dimension and balance should encompass most of the problems arising from temporomandibular joint disease. To these, only two adjuncts are necessary: (1) imagination, originality or mechanical ingenuity, the resourcefulness to create the appliance the individual case calls for, regardless of complications, and (2) the lateral jaw roentgenogram, to confirm, not make, the diagnosis.

Lateral jaw roentgenography of the temporomandibular joint affords an excellent record of the treatment of a case. We would not practice without it, although we probably could. To date, we have made dentures or corrective appliances for more than 250 patients, referred to us and suffering from one or more of the symptoms of what Dr. Costen

calls the "temporomandibular joint syndrome." We have a roentgenologic history of each case. Why? Because as the case is followed from year to year, it is possible always to go back to the original pictures and take new ones for comparison. Roentgenograms acquaint one with the temporomandibular articulation to be treated. They may show one side to be normal, the other not normal. They may disclose what damage, if any, has been done to the articular surfaces. The treatment would be almost the same if these roentgenograms had never been seen. However, the past seven years, at least one-third of our time has been given to this subject and more than 1,000 roentgenograms of temporomandibular joints have been taken. This experience has afforded more than a speaking acquaintance with this articulation, its peculiarities and its great variety of form.

CENTRIC OCCLUSION

In only the rarest of cases may centric occlusion be altered. One of the two cases tenatively called successful, in which the mandible is arbitrarily brought forward, guided there by new inclined planes on the teeth and brought there only for relief of symptoms, will be mentioned. In both cases, the symptoms disappeared. Both patients can, with some effort, still retract the lower jaws to the position from which we started. One was treated six years ago, the other, three. In all other cases, a satisfactory result was impractical if centric occlusion was not correct.

VERTICAL DIMENSION

As also may be case in securing centric relation, while there is trismus within the temporomandibular joint, a true rest position will be difficut to determine and a temporary build-up may be necessary until all inflammatory conditions within and around the joint subside. In all other cases, the fundamental rules followed in denture construction must be adhered to; that is, consideration of a rest position, adequate intermaxillary space, esthetics, etc.

BALANCE

It should hardly be necessary to stress the importance of balanced occlusion in any case. Lack of balanced occlusion in the natural dentition ultimately results in either periodontitis or abnormal abrasion of the teeth. When height is added to teeth, the consequent strain upon the supporting structures makes it all the more imperative to eliminate occlusal interference and strive for bilateral balance in centric relationships, lateral and protrusive excursions. So far, this paper has dealt with simple fundamentals that will be the guide to nearly all phases of dentistry. We have been able to make no additions to that great fund of knowledge already accumulated, but have only substantiated it with a few years rich in experience, both successful and otherwise. The many cases have taught much, especially that there is much to learn. To repeat a once popular phrase, we "view with alarm" the rapidity with which some of our profession threaten to adopt the several arbitrary methods of "bite opening" and only hope that this wave or fad does as little harm as possible to what promises to be an important contribution to public welfare.

We have attempted to differentiate the two types of service, both of which have a place in dentistry. This distinction may be described as follows:

There is a definite line of demarcation dividing the field of bite correction into two distinct classifications. The first is the restoration of facial form and contour and lost tooth structure by building on the occlusal surfaces of the teeth a new occlusal plane. For lack of a better term, this has been called "bite opening," its chief purpose being restoration of form, function and esthetic values to a mouth that has lost them. The ideals embodied in this work should be preservation of

the mouth, prevention of periodontoclasia and transformation of the mouth and jaws into a more efficient machine.

Secondly, and not to be confused with "bite opening," comes repositioning of the mandible to relieve those symptoms which may be classified under "temporomandibular joint syndrome." Repositioning may imply (1) building the teeth to a new occlusal plane, unilateral or bilateral; (2) relieving occlusal interference in order to move the mandible in a lateral direction; (3) relieving occlusal interference so as to remove premature contacts in the molar region, allowing the condyle head to adjust itself correctly within the fossae, and (4) bringing the mandible forward when molar support is gone and the drive of the lower anterior teeth against the inclined plane of the lingual aspect of the upper anterior teeth has forced the mandible posteriorly from its normal position. In this second classification, such changes are brought about solely for the purpose of relieving or preventing temporomandibular joint disturbances.

While the two fields are closely related so far as prevention is concerned, they have been kept apart by different methods of technic and schools of thought. While "bite opening" is usually done by means of overlays, crowns and other permanent fixed appliances, mandible repositioning for joint disease is usually done with the idea of temporary correction, with stilts, splints, combinations of partial dentures and stilts and full dentures, to be worn by the patient for from several months to a year or longer to determine whether such correction will relieve the symptoms.

The temporomandibular joint syndrome is usually accompanied by considerable trismus of the muscles of mastication. With the patient's first relief from these pains, there usually come relaxation of the muscles and the gradual restoration of normal jaw movement. As this will necessitate a constant check and frequent adjustment of the occlusion in the temporary appliances, it is of great importance that permanent work never be done in the early treatment of temporomandibular joint disease. This is one of the outstanding differences in the care of these cases and the treatment of simple bite opening cases.

Detailed case reports will not be given: instead, some of the most common problems experienced will be reviewed.

In Louisville, in 1933, several outstanding otolaryngologists, internists and orthopedists were contacted and the possibility of dentistry's offering this new type of service was presented. These physicians were asked to select cases showing the head and ear symptoms most commonly described, but in which ear, eye and sinus disease either was not present or was under treatment and observation. The orthopedists and internists were consulted in order that pains in the temporomandibular joint region might not be confused with a general pathologic condition. In these experimental cases, all work was to be done gratis. This immediately removed any suspicion that the reference of patients was being solicited. A wide variety of types of cases were thus observed and treated within a few months. The most common type in this early group has continued to be the most common type today; that is, the person who has lost molar support through removal of and failure to replace some or all posterior teeth. All patients in this group felt pain for the first time five to seven years after removal of the teeth. This, of course, does not mean that every one without molar support will suffer. Only a small percentage do so. For instance, I have seldom seen a patient who descended from stock of long-lived people who suffered any symptoms of temporomandibular joint disease, regardless of the neglected condition of the mouth. The patient falling into the first and very common group may have crepitus within the joint and tenderness to

palpation both over and behind the condyle head and within the external auditory canal. He may have difficulty in eating because of the pain in the joint, and there is frequently decided trismus, resulting in greatly limited movement. This may be unilateral or bilateral, according to the clinical conditions. Perhaps there will also be itching in the external auditory canal, sometimes a herpes zoster. Corrections can be made with partial dentures or with partial denture splints or stilts, in which the metal rests are continued and enlarged to give a new occlusal surface to any remaining posterior teeth.

The next most common type case is that of the person with symptoms of congestion of the eustachian tube, whose history will read as follows: Stopped or stuffy sensation in one or both ears, a low buzzing sound, intermittent or constant, and some impairment in hearing. These symptoms usually disappear for a few hours if the eustachian tubes are inflated. This is the case when the maximum increase of vertical dimension within physiologic limits is needed to give relief. Owing to overclosure, resulting in shortening of the tensor veli palatini muscle, muscular tone is lost, and the act of swallowing, a voluntary act to allow passage of air within the tube, is impaired. If the case is not of too long standing, a considerable opening will usually afford the patient perceptible relief within a few weeks. Permanent comfort will come sooner if the patient has the eustachian tubes inflated three or four times a month for several months. The patient may have frequent discouraging recurrences the first year, usually during a time of nervous or emotional strain or fatigue, or if a head cold is present.

Perhaps the most interesting group of patients are those whose symptoms of pain within and around the joint make us certain of overclosure. Yet careful study, usually by means of central-bearing-point intermaxillary tracing, discloses, instead, premature contact in the molar region, usually of the third molar. Removal of this interference brings relief. Had not Clyde H. Schuyler brought this condition to our attention several years ago, a number of our patients would probably be wearing some form of dental appliance needlessly.

Other types of cases are being constantly observed, but those described so far are most frequently seen. All who are doing this work can recite any number of unusual cases which have been treated with rather spectacular results.

M. presented a story of periodical attacks of excruciating pain of the left ear and side of the face, occurring every three or four weeks and lasting from two to four days. There was a constant low buzz in both ears. Both this and the attacks of pain were of four years' duration. Clinical study showed that the face had shifted to the left side. A full denture above and partial below maintained this position. The roentgenograms of the joint reveal wear of the articular eminence on the left side and what appears to be a fragment of the tympanic plate lying out of position on the right. The patient had been retired from active military service for years, and it was only after several visits and constant questioning that he could recall an accident in the service twenty years ago, when he received a blow which apparently fractured the section of the right tympanic plate, forcing him to chew, for comfort, well over to the left. The attacks of pain were probably the result of pressure on the nerve. The buzzing in the ears was never satisfactorily explained, as it had never been relieved by inflation of the eustachian tubes. However, when dentures were made with correct centric relation, opening and balance, the attacks of pain disappeared. One year later, the tinnitus too had left, and, to date, five years later, the results of treatment are 100 per cent satisfactory. This patient was under the constant observation, but not the treatment, of one of Louisville's leading internists.

Mrs. S. had fainting spells from three to six times a week, lasting from thirty to forty-five minutes and of two years' duration.

Any high pitched, vibratory sound would cause the fainting spells—a violin note, a shrill whistle, the screeching of brakes and many other sounds. The otolaryngologist who referred Mrs. S. reported no pathologic conditions in the ears, eyes, nose or throat and stated frankly that he was sending the patient to us as a last resort as he could neither diagnose nor cure. Clinically, there was an extreme overjet, the patient having an exaggerated retruding chin. Roentgenograms revealed a posterior displacement of the condyle head. Thus, when the mandible was brought forward more than one-eighth inch and kept there with a partial denture stilt, the condyle head still articulated with the posterior inferior surface of the articular eminence. Within a week of the insertion of this corrective appliance, the character of the fainting spells changed. They now occurred more frequently than before, but lasted for only from three to five minutes. Within two months, they were lasting for only a few seconds. At the end of six months, they ceased entirely. In March of last year, some fillings were changed under the appliance. The fillings were not polished perfectly and, as a result, the appliance failed to seat itself properly, so the patient did not wear it for a week. A few dizzy spells and threats of another fainting spell brought her to the office. When everything was adjusted and the partial denture again was worn, all was well and still is. No satisfactory explanation of this result can be given.

Mrs. S., aged 75, with several teeth missing above and below and those remaining badly worn, was under the care of a heart specialist, who said that she could not stand the shock of dental extraction. She had pain in the condylar region and a stuffy feeling in her ears every time she closed her mouth. She had had periodontal treatment for years and the gingival tissue was inflamed. Dental x-ray films showed cancellous bone and almost no areas of density. Splints were cemented to the lower teeth, restoring the vertical dimension. All-metal dummies were substituted for the missing teeth, these splints actually serving as two fixed bridges. All pain was gone within forty-eight hours. However, ten days later, the patient complained of tenderness of the gums. Examination revealed that all the lower teeth had been depressed until the pontics were half buried and out of sight. One splint was removed and the other left in place. Within two weeks, the depressed teeth had elongated into occlusion and the splint on the other side was removed. All of the original symptoms had returned. A partial denture building up the occlusion with gold restorations instead of rests on the natural teeth was made. The patient was instructed to wear it during the day and remove it at night, in the belief that this would give the teeth, depressed during the day, an opportunity to return to their starting place. Even this was not satisfactory, and there was too much weight or stress on the natural teeth. Two years later, Mrs. S., discovered, through trial and error, that she could wear the appliance from five to six hours a day without depressing the teeth, and she does so, suffering some when the appliance is out, but getting considerable relief when it is in.

Frequently, under cemented splints, the posterior teeth will be depressed slightly. On removal of the splints, the teeth will be restored quickly and with no apparent damage. This fact, however, has led us to make more removable appliances than fixed. The removable appliance allows more accurate control of the type of mouth changes just described. Also, it is more hygienic, as the appliance and the teeth can be kept clean by the patient. With the cemented splint, there is always the possibility of decay under the crowns. The decision as to what type of appliance to make is not of tremendous importance. Far more important are careful history taking and examination, conservative judgment in diagnosis and treatment and honesty with the patient regarding prognosis.

This, we believe, constitutes an approach to a rational study of the temporomandibular joint problem.

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Starks Building.

Breslin Building.

PHYSICAL PROPERTIES OF WROUGHT ALLOYS USED IN DENTISTRY

By WILLIAM H. CRAWFORD,* D.D.S., and RALPH W. PHILLIPS, A.B.,
Indianapolis, Ind.

THE first part of this paper will be devoted to an explanation of the terms used in presenting, interpreting and applying data which are to follow and which concern the physical properties of materials used in dentistry.

There is considerable difference between explanation of terms and recitation of definitions. In applying this distinction specifically to proportional limit, for example, there is a vast difference between understanding and applying this term and disposing of it by saying that proportional limit is the stress at which the deformation as measured by the extensometer ceases to be proportional to the load.

The term proportional limit can be explained very easily with the aid of a small instrument such as is illustrated in Figure 1. In this instrument, the wire on which we shall illustrate proportional limit is clamped in such a way that, without load, it points to zero on the deflection scale. On loading a small amount, as indicated in Figure 2, in this instance a quarter of a pound, the wire is deflected 0.007 inch at point of load. When this load is relieved, the wire returns to zero, an indication that there is no permanent deflection and that such deflection as has occurred is purely elastic and within the elastic limit. As the test is continued, another quarter pound is added, and the wire is deflected 0.014 inch, or just twice as much as for the quarter pound load. Here, we note that deflection is proportional to load. When the load is removed, the wire again returns to its starting point, an indication that such deformation as has occurred is still purely elastic and not permanent or plastic.

As this process is continued, we eventually reach a load that bends the wire so far that it does not return to its starting point, thus indicating that the deformation is not purely elastic, but partly plastic or permanent, and we have reached the limit of elastic deformation. At approximately the same time, we discover that a one-quarter pound load makes the wire bend more than 0.007 inch, and we have reached the load at which the deformation is no longer proportional to the load increment. The load required to bend the wire permanently will depend on two, or possibly all, of the following: chemical composition of the wire or alloy, amount of cold working to which the wire has been subjected and the heat treatment of the wire. The influence of each of these factors will be considered later.

From a practical standpoint, the dentist is deeply concerned with proportional limit, which is frequently referred to as yield point, as well as elastic limit. Actually, the elastic limit is very slightly lower than the proportional limit, and they are both somewhat lower than the yield point.

We have discussed five terms commonly used by those concerned with the physical properties of materials, whether they be metals or otherwise: elastic limit, proportional limit, yield point, plastic deformation and elastic deformation. The

*Dean, Indiana University School of Dentistry.

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first three terms are used in describing the stress required to produce plastic deformation as distinguished from elastic deformation.

Proportional limit is not usually determined by the bend test because this test involves both tensile and compressive properties. In the bend test, the fibers are stretched on the outside and compressed on the inside of the bend. The figure representing proportional limit that is given by manufacturers is secured by testing the wire in tension only, as indicated in Figure 3.

An instrument which measures the

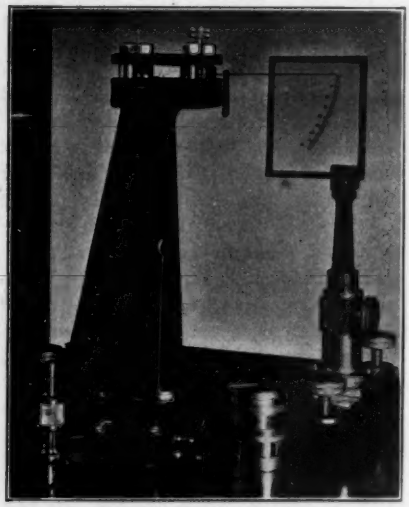

Fig. 1.—Franke static flexure tester for loading and measuring deformation of dental wrought gold alloys.

amount that the wire stretches is attached to the wire, after which it is loaded either by mechanical methods or by dead weight. The method illustrated here is by dead load. After each load of equal increment is applied, measurements are made and the proportional limit is determined at a load where the rate of deformation is increased by 25 per cent.[1]

The proportional limit discloses the resistance of the material to plastic or permanent deformation. If the proportional limit is relatively low, the material may be permanently bent more easily than if this property is high. Therefore, in adjusting a wire to a different shape, it is desirable that the proportional limit be as low as possible to facilitate accuracy and ease of adjustment. It is also desirable that the proportional limit be high when the piece is placed in service, to assure resistance to permanent deformation in function.

Proportional limit is strictly a strength property indicating the upper limit of elastic deformation and marking the beginning of plastic or permanent deformation. Because elastic deformation increases with an increase in proportional limit, there frequently exists some confusion between the application of this property and the property which concerns the amount that a wire will bend for a given load within or below the proportional limit. Materials differing in chemical composition have the property

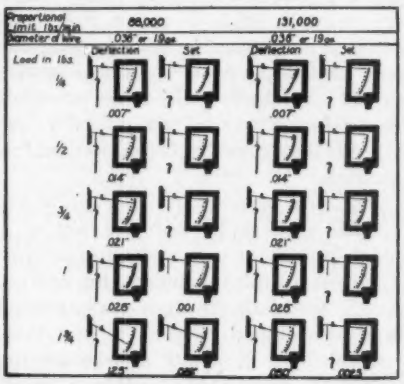

Fig. 2.—Franke static flexure test; showing proportional relation between deformation and load below plastic or permanent deformation which marks proportional limit. This series also shows that there is no change in flexibility or elastic properties when the samples are soft or hard. Elastic deformation is the same even though the proportional limit varies from 86,000 to 131,000 pounds per square inch.

of bending or stretching different amounts for the same load. This elastic property within the proportional limit should not be confused with the strength of the material, which is designated by proportional limit. For example, a strong piece of steel and a soft nail will bend at the same rate within the strength of the nail. A gold alloy wire also will bend the same below the proportional limit in the softened or the hardened condition. The stronger wire is no stiffer within the proportional limit. Figure 2 also serves to show that, within the proportional limit, two test samples become deformed the same amount for the same load provided the chemical composition is the same, though one sample may be heat

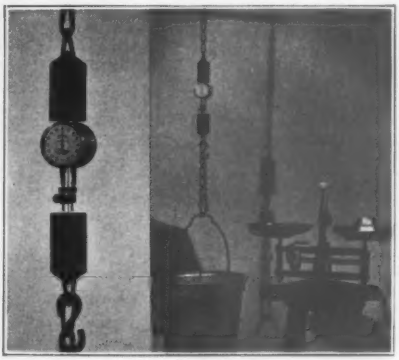

Fig. 3.—Equipment used for determining proportional limit which includes sensitive apparatus for measuring elongation known as extensometer and system for loading wire.

treated in such a manner as to make it much stronger. However, loaded exactly the same, a gold alloy wire of the same diameter will bend just twice as much as a steel wire.

Modulus of elasticity is the term used to describe the amount that a wire will bend for a given load within the proportional limit. Figure 4 illustrates the manner in which this property is secured.

The two curves shown in Figure 4 represent the amount that a steel wire and a precious metal wire actually stretched under loading conditions, which were the same for the two wires. It will be noted that, for the same load, the precious metal wire stretched considerably more than the steel wire. For a load of 50 pounds, between 40 and 90 pounds, 2 inches of the precious metal was stretched 0.00535 inch, whereas the same length of steel wire stretched only 0.0027 inch. In terms of inches per inch, this means that the precious metal wire stretched 0.00268 inch, the steel wire 0.00135 inch. The load which was applied in terms of pounds per square inch for this deflection was 39,800. The modulus is secured by dividing the load in terms of pounds per square inch by the amount the wire stretches for each inch. In this particular instance, the figure representing the modulus for the precious metal is 14,700,000, the figure representing the modulus for steel, 29,400,000, or approximately twice as much. Therefore, a wire that is stiff or inflexible will have a high modulus, whereas a wire that is flexible or very elastic will have a low modulus. This has its application in the manner in which structures and retainers for partial dentures are intended to function. If it is desired to have the structure rigid and inflexible, a material that has a high modulus should be selected. This would mean selecting stainless steel or one of the base metal non-corrosive stellite type alloys. If it is desired to have a material that is flexible, one should be selected that has a low modulus. A clasp intended to serve as a retainer for a partial denture will transfer less pressure to the tooth for any movement of the denture if made with a material that has a low modulus.

Examining the application of this property more closely, let us refer to Table 1, which shows the results of a bending test made by the Franke instrument on 19 gage steel and 19 gage gold having the same proportional limit.

At a load of 1 pound, the steel wire

was deflected 0.014 inch, whereas the gold wire was deflected twice as much. Referring this to the partial denture problem, let us suppose that the retaining clasp arm is affected by a movement of the denture amounting to 0.014 inch. It will be noted from this table that the pressure transferred to the tooth by this movement of the denture will be 1 pound in the case of the steel wire and only one-half pound in the case of the gold wire. Likewise, if the arm of the clasp is forced to move 0.028 inch, the gold wire will exert a pressure of only 1 pound; whereas the steel wire will exert a pressure of more than 1¾ pounds, which is above the proportional limit of the steel and will cause permanent deformation of the steel clasp.

Table 1 indicates that rigid retainers can best be secured by slightly increasing the gage of the wire used for the retainer. Eighteen-gage gold is slightly stiffer than 19-gage steel, and, at the same time, it will not become permanently deformed until much higher loads are applied.

Extreme flexibility, if desired, can be secured by decreasing the diameter or gage of the wire. Twenty-gage gold will be deflected approximately twice as much as 19-gage gold for the same load. Those familiar with the Gillett type of partial denture construction can readily recognize, therefore, why a small gage of precious metal wire is used for the retainer. Great flexibility is secured because the wire is small and the modulus is very low for the precious metal. Partial dentures depending on support from as many teeth as possible should be made rigid.

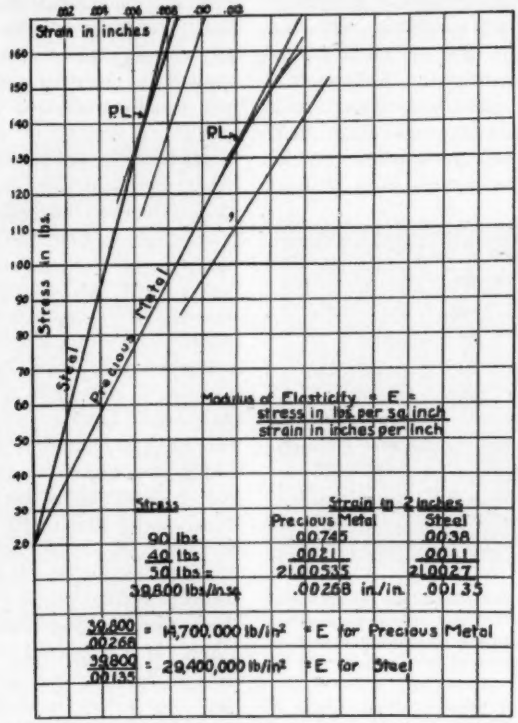

Fig. 4.—Stress-strain diagram showing variation in rate of elastic deformation for steel and precious metal alloys.

For this reason, operators have found that dentures of the stellite type alloys can be made thin and still be rigid.

If an extremely flexible material is desired, it is much easier to note on the tables furnished by manufacturers what the modulus of elasticity is than to experiment with a large number of available alloys. We should like to note here statements made to us by two excellent operators, one an author and student of partial denture construction, the other a well-known orthodontist. Both required a wire with great flexibility. The orthodontist needed such a wire for a finger spring, and the prosthodontist needed a very flexible wire for a special type of lock attachment. After considerable experimentation, each decided that the same wire was most satisfactory. This

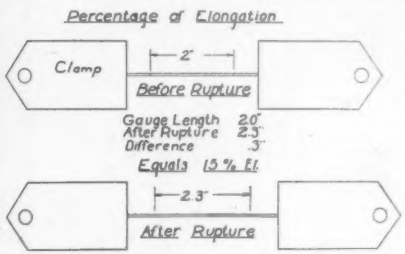

Fig. 5.—Method used in obtaining percentage of elongation.

particular wire, of all wires that we have tested, had the lowest modulus of elasticity; namely, 12,000,000 pounds per square inch.

The modulus for precious metal wires will vary from 12,000,000 to 20,000,000, with most of them at about 15,000,000. Still, the small variation in the flexibility of a wire with a modulus of 12,000,000 as compared to other metals the modulus of which was only slightly higher was noted by these careful operators. The difference between steel and precious metal is easily observed by any one using these two metals, and each has its place in dentistry. An intelligent selection based on physical requirements of specific needs is recommended.

The next important property is ductility. If a wire is ductile, it may be bent without breaking. If it is not ductile, a slight adjustment or bending may cause breakage. There are a number of factors which influence ductility and a number of methods of measuring ductility. It will be remembered that when a wire is loaded beyond the proportional limit, permanent or plastic deformation occurs immediately, and the amount of plastic deformation that will occur before the wire breaks is a measure of its ductility. This may be expressed in terms of percentage of elongation, reduction in area or cold bends.

Figure 5 represents the method by which the percentage of elongation is determined. The upper part of the illustration indicates a piece of wire attached in two clamps. Upon the wire are two marks, in this case 2 inches apart. The lower portion of the figure illustrates what occurs during loading of the wire sufficiently to cause rupture. After fitting the two pieces together, it is found that there has been sufficient plastic deformation to cause the distance between the two gage marks to increase to 2.3 inches. This is 0.3 inch increase in length for the 2 inches and represents an elongation of 15 per cent. We normally consider a material that will elongate 10 per cent one that is not apt to break when bent. This is usually, but not necessarily, true because sometimes a wire with 10 per cent elongation may be extremely brittle.

Figure 6 represents the appearance of two gold wires which have been broken in such a test. It will be noted that the wire at the left, which was heated to 1300° F. only, has considerable constriction at the point of rupture, whereas the wire at the right, which was heated to 1800° F., broke without this marked reduction in area at the point of rupture. The character of the rupture is an indication of ductility. The wire at the right shows very little reduction in area at the point of rupture. However, this particu-

lar wire showed an elongation of 9.5 per cent, which is considered sufficiently high to safeguard it against danger of breakage during use or minor adjustments. However, the same wire, when bent, proved to be extremely brittle. Therefore, a high percentage of elongation is not necessarily a guarantee of ductility. A large reduction in area is much more reliable as an indicator of ductility. Bringing both of these properties close to the particular problem, we find that we are seeking an expression which will tell us whether we can bend the wire without danger of breakage. This could be best reduced to its simplest form by using a cold bend test rather than an unreliable figure.

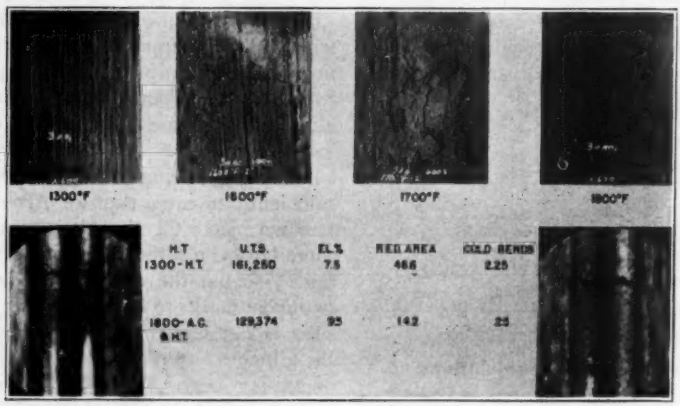

Fig. 6.—Constriction at point of rupture on ductile material; lack of reduction in area on brittle material, and changes in structure of wrought gold alloy by heating to various temperatures between 1300° and 1800°F.

Figure 7 illustrates the cold bend test which has been used by a number of investigators, but which has not been officially accepted as scientific. However, it does tell us what we wish to know, and and that is whether the wire can be bent without breaking. In the data which are to follow, cold bends that have been obtained as shown in this illustration will be indicated.

In selecting satisfactory metals, the melting range or fusion temperature should be given serious thought. If metals are to be melted and cast, a knowledge of the upper and lower limits of the melting range is important, because it is necessary to heat well above the upper limit of the melting range in order to make satisfactory castings. At the same time, the lower limit should be considered in its relationship to soldering processes. In using wrought gold, melting the alloy is avoided, or at least should be; therefore, the lower limit of the melting range is the only part to be given serious consideration. Because it is difficult to obtain the melting range and because we are interested only in the lower limit in wrought alloys, a test has been devised to secure a figure at the lower end of the melting range. It is relatively simple to obtain this figure, known as the fusion temperature, accurately. The importance of a knowledge of fusion temperature will become apparent during the discussion of data to be presented.

Strength of alloys used in dentistry is affected by, first, chemical composition; second, cold working, and, third, percipitation hardening. We are familiar with the fact that pure gold, though highly resistant to corrosion and discolor-

ation, is in itself much too weak to be used for a structural part of a dental appliance. Therefore, other metals are alloyed with gold to produce proper strength and ductility for our many specific purposes. Copper is one of the most important metals used to strengthen gold and yet retain ductility. However, use of this metal lowers the melting range of the alloy formed by its addition to such an extent that solder of satisfactory nobility cannot be used. Therefore, other metals, platinum and palladium specifically, are added to the alloy to raise the melting range above the danger point for soldering operations. In various proportions, gold, copper, platinum and palladium produce a large variety of precious metal alloys with considerable

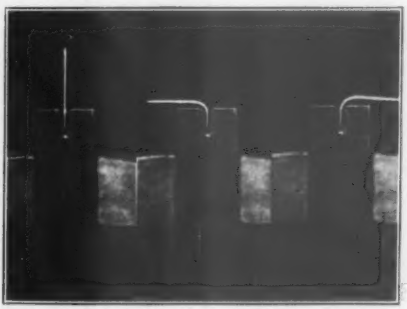

Fig. 7.—Cold bend test. The wire is held in a clamp and bent over a rounded corner. The number of times the wire will stand a complete reversal will indicate the number of cold bends.

variation in strength and susceptibility to hardening by heat treatment. All will unite and be completely soluble in each other under certain heat treatment, but are also capable of forming insoluble compounds under certain other heat treatment which will have a hardening effect in the alloy. For example, gold and copper in all proportions are completely soluble in each other at temperatures above 840°F. and, when in solution, have a tendency to cause the alloy to be in a softened condition. However, equal atomic portions of gold and copper may form insoluble compounds at temperatures between 480° and 840°F., which have a tendency to harden the alloy. Copper forms insoluble compounds with palladium at temperatures as high as 1300° F. These also tend to make the alloy harder, and the alloy, if held at these temperatures, will become hardened by the compounds. Therefore, alloys containing certain proportions of copper and palladium will not be softened by holding or heating at temperatures up to or at 1300°F., but will become harder.

The fact that one wire will harden under the same heat treatment that

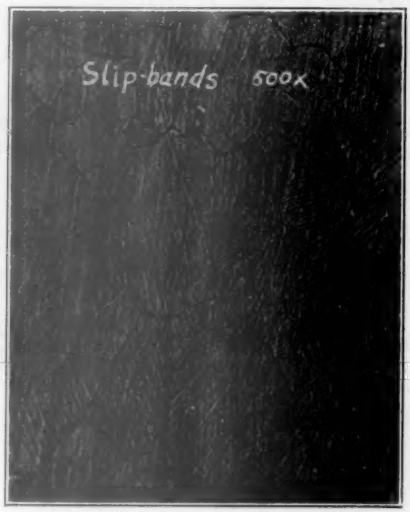

Fig. 8.—Structure of wrought gold alloys; showing effect of strain and production of slip bands.

causes another to soften is sufficient reason for a fundamental understanding of the mechanics involved in softening and hardening processes. As has been indicated, the physical properties of metals may be changed by varying the chemical composition. There are also two other factors which influence change in physical properties of metals. One of these is cold working, which may be done

by swaging, drawing or bending; in fact, any process that changes the shape of a wire will tend to harden or strengthen it. This type of hardening can be readily relieved by heating the wires to sufficiently high temperatures. Frequently, 1300°F. will relieve the strain hardening due to cold working. Strength present in wires and due to cold working is of little value to the dental profession, because soldering operations, which are a part of the use of wrought gold alloys, are always at sufficiently high temperatures to relieve any effect of cold working. In years past, manufacturers have sold their wires to the dental profession with considerable strain or work hardening remaining in the wire from the last drawing operation. However, more recently, manufacturers of wrought gold alloys have been placing these materials on the market in the fully annealed or softened conditions. The other method of hardening wrought gold alloys is a process known as precipitation hardening, and, in the case of dental gold alloys, it is usually the result of formation of certain compounds which tend to strengthen the alloy.

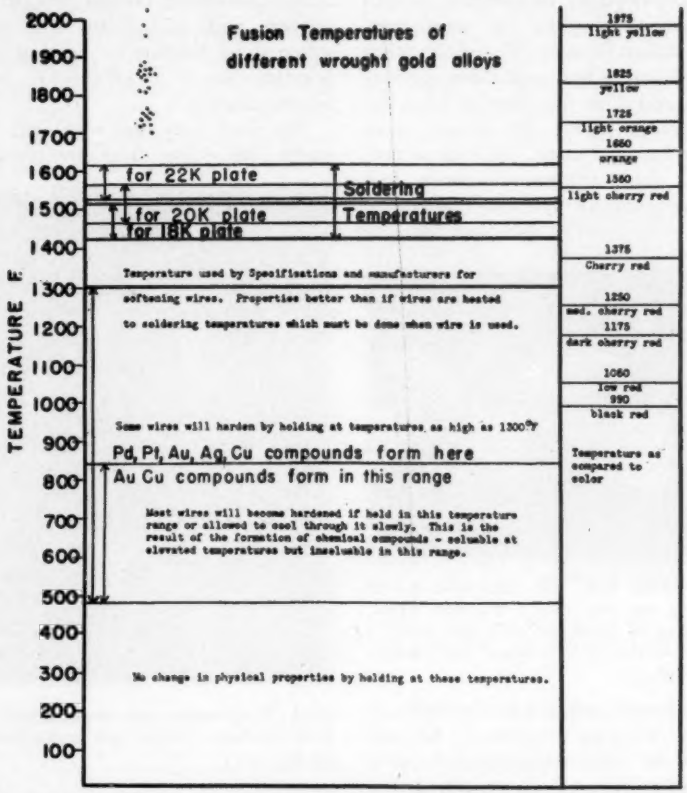

Fig. 9.—Fusion temperatures of wrought alloys, melting ranges of various solders and temperatures at which various hardening compounds may be formed.

Figure 8 illustrates the manner in which an alloy can be strengthened by the formation of compounds within the metal. When a metal is loaded above the proportional limit, there occurs in each

crystal a certain permanent deformation along planes within the crystal, known as slip bands. When all of the metals within the crystal are completely dissolved in each other, the crystal is free to move on these planes without interference. However, when the metal is held at such temperatures as will cause certain portions of the metal within the crystal to form chemical compounds, these compounds act as keys to prevent slippage. In the process of hardening a metal by heat treatment, compounds are formed which prevent slippage and strengthen the alloy by strengthening the crystals, thereby making the metal more resistant to permanent deformation. As different compounds are formed at different temperatures, each wire must be considered as responding best to a certain heat treatment individual for that particular wire, and no single heat treatment is the best for all wires.

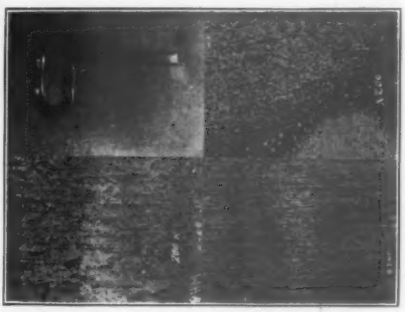

Fig. 10.—Section of orthodontic appliance; showing solder joint.

The cold working process coincident to the making of wrought wire does, however, change the structure of metals from cast structure to a condensed fiber-like structure which has superior qualities. Therefore, it is important that we maintain the fibrous wrought structure put into the wire by the manufacturing process. Heating operations accompanying soldering frequently destroy this structure and are accompanied by impairment in physical properties.

Figure 9 shows the melting range of the various common solders used in assembling wrought gold appliances. It will be noted that the upper limit at which solder for 22-carat plate melts is somewhat above 1600°F. Therefore, in using this particular solder, it is necessary to heat the wire at least to the upper limit of the melting range of the solder and somewhat higher to make the solder flow well. Therefore, under most favorable circumstances, wires will be heated to approximately 1650°F. If the operator is not extremely careful, the small wires will be heated to even much higher temperatures.

Figure 9 shows the close proximity of the upper limit of the soldering ranges to the fusion temperature of many wires. It also shows the temperature range over which hardening may be expected to occur provided the chemical composition of the alloy is capable of producing compounds of gold, platinum and palladium with copper.

Figure 6 shows the progressive changes in a wrought gold alloy when heated to elevated temperatures. At 1300°F., the wire has an excellent wrought structure. At 1600°F., a certain degree of recrystallization has occurred, which is increased further by heating the wire to 1700 and 1800°F., as illustrated. With this particular wire, 1800°F. was below the fusion temperature. Variation in the physical properties will be noted. Whereas the wire is strong and ductile under the 1300°F. heat treatment, it is much weaker and extremely brittle after being heated to 1800°. However, in this particular wire, the percentage of elongation increased from 7.5 to 9.5 per cent, but cold bends decreased from 2.25 to 0.25. The character of the fracture as illustrated also indicates that the wire is extremely brittle. Prosthodontists using wrought gold alloys have long been troubled with brittleness and breakage in wrought gold clasps and have found that breakage usually occurs at or near solder

joints. After noting the physical properties listed by manufacturers of wrought gold, it is difficult to understand how wrought golds fracture so easily. The difficulty lies in the fact that manufacturers publish their physical properties as determined after heating the alloys no higher than 1300°F. This is far below the temperature to which the wires must be heated during soldering operations, and little has been published or made known regarding the properties of alloys after they have been heated to soldering temperatures.[2]

As users of wrought gold alloys, we are not interested in the physical properties present after heating to 1300° only, but we are deeply concerned with the physical properties of the materials after heating to temperatures corresponding to actual use. Manufacturers should not be criticized severely for using 1300° as a standard temperature in heating wrought wires before testing because this is the maximum temperature outlined in American Dental Association specifications for heating wrought gold alloys.

Figure 10 shows a section of an orthodontia appliance which has been overheated during the soldering operation. The upper right hand portion shows the coarse crystalline structure at the solder joint. The lower left hand portion of the illustration shows the structure near the solder joint and the lower right hand portion of the illustration shows the wrought fibrous structure away from the solder joint. The coarse grain structure is much weaker and more brittle than the wrought structure, especially after heat treatment. With the heat concentrated at the solder joint, it almost always follows that this condition exists, resulting in a decrease in strength and increase in brittleness at or near the solder joint. As it is here that the greatest stress is concentrated, breakage usually occurs at or near the solder joint. Manufacturers who have recognized this situation have attempted to produce wires which are

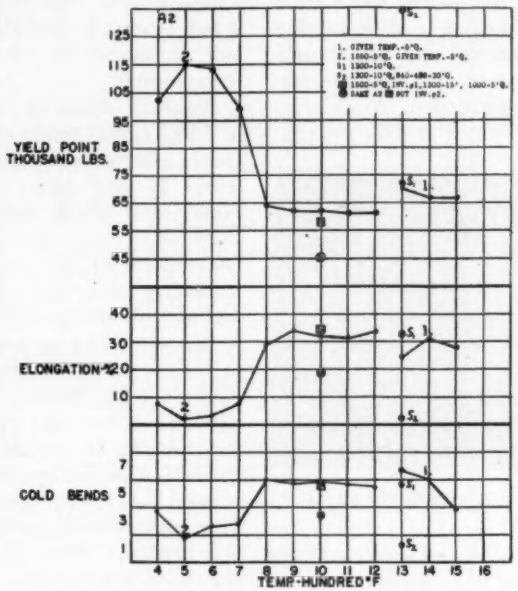

Fig. 11.—Physical properties of wrought gold alloy.

not seriously affected, as far as strength and ductility are concerned, by heating to well above soldering temperatures. This has been accomplished by raising the fusion temperatures well above 2000.° When the fusion temperature is elevated by increasing the palladium content, as is frequently the case, the susceptibility to hardening by the formation of copper and palladium compounds is increased.[3] It will be remembered that these compounds form at temperatures up to 1300°. Therefore, in order to get many of the modern alloys in a softened condition, unaffected by either cold working or chemical compounds, it is necessary to anneal or soften at temperatures well above 1300°.

We should like to presēnt a rather detailed study of a few currently used wrought alloys to illustrate the necessity for careful study of the properties of each individual wire if the best results are to be obtained.

Figure 11 illustrates the effect of various types of heat treatment on a commercial alloy. It will be noted that the yield point, curve 1, does not drop perceptibly on elevation of the annealing temperature from 1300° to 1500°. This wire was not heated above 1500° because its fusion temperature is only 1580° F. In using this wire, one would have to select a rather low carat solder, as solders of high nobility would either melt the wire or bring it so close to its melting range as to ruin the wire. The percentage of elongation is high and the number of cold bends is amply high in the annealed condition to insure freedom from breakage during adaptation. The interesting part about this particular wire is the temperature range through which hardening can be accomplished. It will be noted, curve 2, that at temperatures above 700°, this wire is not affected by precipitation hardening. The most effective temperature to produce hardening is 500°F. It will also be noted that, even though the elongation is only 2 per cent,

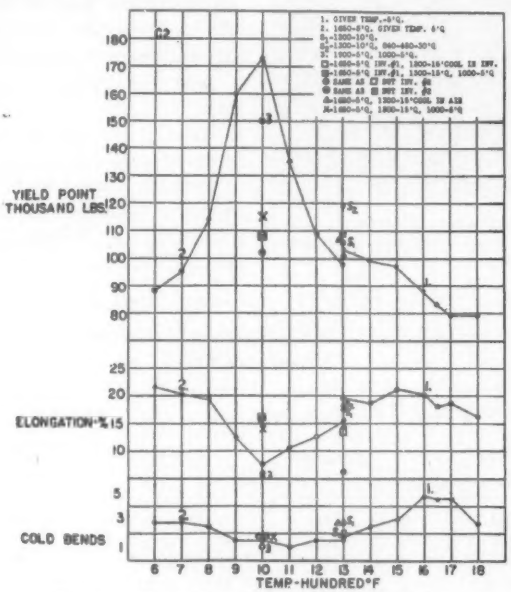

Fig. 12.—Physical properties of wrought alloy.

cold bends indicate that the wire is of sufficient ductility to permit a small amount of adjusting.

Figure 12 shows the properties of quite a different type of wire. This wire has a fusion temperature well over 2000°. It will be noted that the yield point

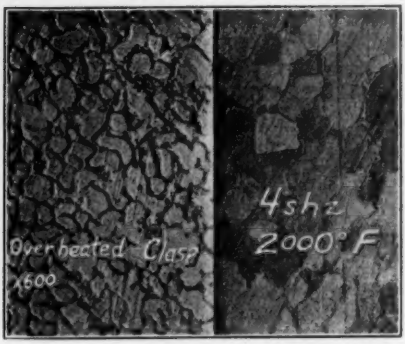

Fig. 13.—Microstructure of broken clasp and wrought gold alloy heated to 50° above fusion temperature.

limit of hardening by compounds of gold and copper is approximately 840°F. This material has its maximum hardening effect at 1000°F., and holding the wire at this temperature for five minutes will increase the yield point 100 per cent higher as compared to the yield point secured by heating the wire to 1650°. Increasing the strength is usually accompanied by a decrease in ductility. The percentage of elongation in this case indicates that the ductility is decreased as the strength is increased. However, cold bends do not follow the pattern made by percentage of elongation, this material remaining ductile even though the yield point is well over 170,000 pounds per square inch.

Point 3 on the chart indicates the physical properties of this wire even after it has been abused by heating to temperatures as high as 1900°F. followed by a hardening heat treatment. Elongation on this test was less than 1 per cent. However, the cold bend test indicates that considerable adjustment could be made in this material even after this abusive heat treatment. A temperature of 1900° F. may appear to be a ridiculously high one to which to subject the wire, but examination of a large number of broken clasps shows definitely that many operators are very careless and heat the wires

TABLE 1.—RATE OF DEFORMATION OF STEEL AND GOLD WIRES OF DIFFERENT DIAMETER

Load Pounds	Flexibility of Wire							
	19 Gage Steel		19 Gage Gold		18 Gage Gold		20 Gage Gold	
	Deformation	Set	Deformation	Set	Deformation	Set	Deformation	Set
¼	0.004	0	0.007	0	0.003	0	0.013	0
½	0.007	0	0.014	0	0.008	0	0.025	0
¾	0.011	0	0.021	0	0.012	0	0.037	0
1	0.014	0	0.028	0	0.016	0	0.049	0.001
1¼	0.018	0	0.035	0	0.020	0	0.063	0.003
1½	0.022	0.001	0.043	0.001	0.025	0	0.084	0.008
1¾	0.026	0.002	0.052	0.002	0.029	0		
2	0.033	0.006	0.065	0.006	0.034	0.001		

drops gradually as the annealing temperature is increased, as indicated by curve 1, opposite the yield point. This wire is also considerably stronger than the previous one shown. In the previous wire, the hardening effect all took place at temperatures below 700°. In this material, hardening is effected by holding the temperature above 700°. The upper

excessively. This can be done very easily if the parts being joined are not well cleaned, approximated, invested, fluxed and heated.

S_1 indicates the strength and ductility of this material when given the American Dental Association specification heat treatment for softening the wire. Holding this material at 1300°F. is not a softening heat treatment; in fact, it makes the wire stronger. This wire quenched from 1650°F. has a strength of 83,000 pounds per square inch, but when this treatment is followed by holding at 1300°F. for five minutes, the strength increases to 98,000 pounds per square inch. Holding the wire at 1300°F. does something to the wire which makes it incapable of hardening to its maximum efficiency as indicated at X. We mention this because wires are sometimes invested and cast against in partial denture construction. In this procedure, the wires are held at 1300° F. to eliminate the wax, and after such a treatment, the wire would be incapable of being hardened by heat treatment. This material is not seriously injured by action of the two investments employed. Other materials may be, as will be indicated later. It will also be noted that this material is not hardened perceptibly by cooling from 840° to 480°F. in thirty minutes as indicated by S_2.

Figure 13 illustrates that a clasp can be accidentally heated to temperatures above the fusion temperature. In this case, the broken clasp was of the same alloy as the test specimen heated 50°

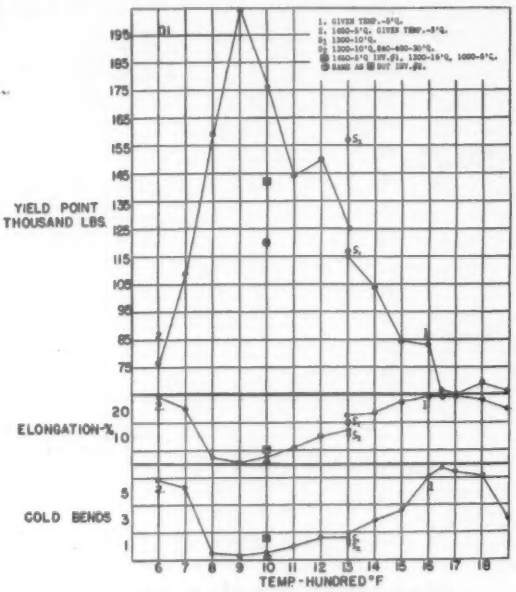

Fig. 14.—Physical properties of wrought gold alloy.

above the fusion temperature of the wire. Similarity of structure indicates that the clasp had been heated to approximately the same temperature as the test specimen. Both show a separation of a second phase, indicating that the wires were heated to temperatures above the lower limit of the melting range. This procedure of determining the temperature to which wires have been heated can be followed with any wire. While grain

growth is a factor of both time and temperature, it is only slowly effected by time and very rapidly effected by temperature. By comparing the microstructure of the clasp, which has been heated to an unknown temperature, with that of pieces of the same material which have been heated to a series of known temperatures, it is possible to get a close idea as to how hot the clasp has become during soldering or annealing.

Figure 14 shows still another wire that is extremely susceptible to hardening in service, are not brought out in this wire by following recommended (specification) heat treatments. The wire does not become soft by heating to 1300°F., nor is its strength increased materially by slow cooling from 840° to 480° in a period of thirty minutes. These properties are indicated by S_1 and S_2. However, the material is extremely susceptible to hardening effects. Holding this material at 900° for five minutes produces a yield point of 200,000 pounds per square inch, but it will also be noted that both

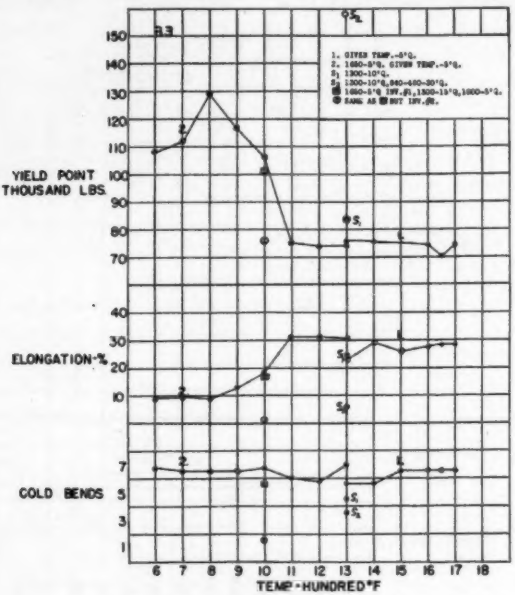

Fig. 15.—Physical properties of wrought alloy.

heat treatments. Curve 1 opposite yield point indicates that this material loses strength rapidly by elevation of the temperature up to about 1650°. Annealing this wire at 1300° for ten minutes leaves the wire in a very strong and somewhat brittle condition for general adaptation purposes. The advantages, if any, of being able to heat treat wire so as to vary the physical properties and make the wire soft and ductile for ease of adaptation, and strong and resistant to deformation elongation and cold bends are extremely low, indicating that the wire is extremely brittle. It does no good to heat treat a wire in such a manner as to produce great strength if this is accompanied by brittleness. There are few instances when minor adjustments are not desirable, and the material should always be left sufficiently ductile to permit such adjustments. Attention should also be called to the fact that this material is hardened by holding at 1300° as indicated by

curve 2. The strength increased from 67,000 pounds yield point after complete annealing at 1650°F. to 125,000 pounds per square inch by holding at 1300°F. This material was seriously damaged by being embedded in one investment and being held at 1300°F. for fifteen minutes, as indicated by X. However, it was not injured by the other investment.

Figure 15 shows the properties of an alloy which does not change greatly on heating to elevated temperatures, as indicated in curve 1. Cold bends indicate that the material is extremely ductile when it is the intention to cast against it. It is shown here that one of the investments proved to be particularly injurious to the metal. It was found that this investment quite consistently proved to be more injurious to the wires than the other investment used in this series of tests.

The material illustrated in Figure 16 appears to represent an attempt by the manufacturer to produce a wire that is more or less self-hardening, but, in any case, it is not particularly susceptible to a hardening heat treatment. It loses

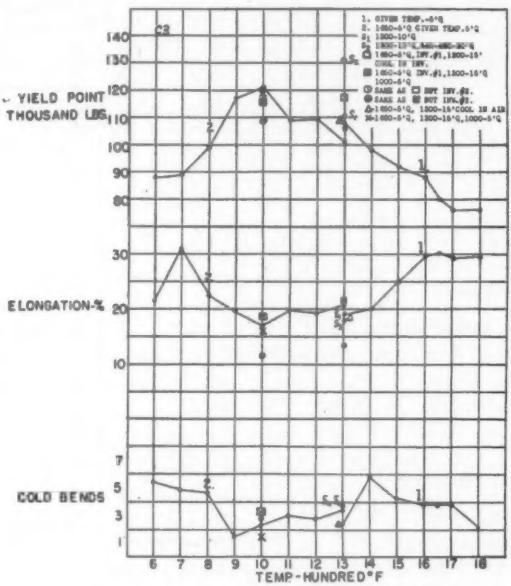

Fig. 16.—Physical properties of wrought alloy.

with all heat treatments to which it was subjected. Holding the wire at 800° increases the strength considerably. Slow cooling from 840° to 480° over a period of thirty minutes produces great strength in this material without serious loss of ductility. This material, as will also be noted in the case of the others shown, was heated in dental investments in a manner corresponding to that in which a wire would be imbedded in investment

strength quite rapidly on heating to temperatures up to 1650°, after which little change is noted. It is slightly susceptible to hardening heat treatment, and no treatment to which this wire was subjected produced brittleness. It was not affected by either of the investments in which it was embedded.

The physical properties of the alloy illustrated in Figure 17 indicate that this material loses strength rather rapidly on

heating to temperatures above 1300° and that it is not susceptible to hardening heat treatment. If it is believed that an alloy which has a yield point of 95,000 pounds per square inch is sufficiently strong to withstand permanent deformation in service, this material would serve very well. However, it is not possible to make it soft for adaptation and to take advantage of hardening effects.

With the properties of the various alloys which have been illustrated, one can readily see the importance of an understanding of the physical properties of each individual alloy. Heat treatment may be accidental as well as intentional. In assembling a case, an operator might easily hold a part at 1000° for a rather prolonged period and accidentally produce extreme brittleness by a hardening heat treatment. Where hardening heat treatments are anticipated, it is advisable to quench the appliance from some temperature above that which will have a hardening effect and then subject the appliance to the most desirable hardening heat treatment.

We should also like to suggest that manufacturers indicate the physical properties of their materials after the materials have been heated to some temperature approximating actual use. The wires shown here have nearly all been subjected to 1650°F. for five minutes as an arbitrary temperature slightly above the upper limit of the melting range of 22-carat solder.

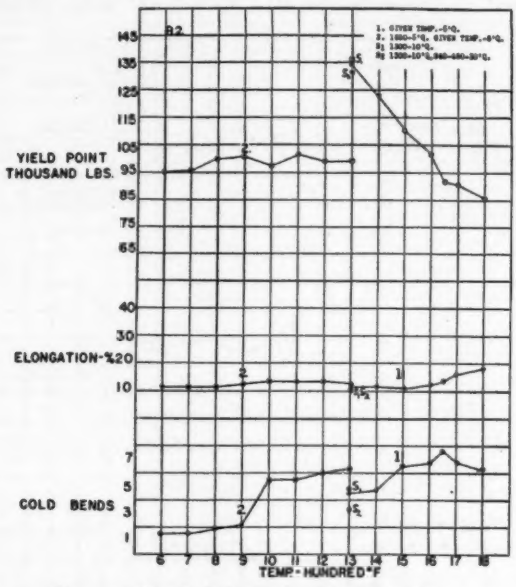

Fig. 17.—Physical properties of wrought alloy.

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ALL-PLASTIC IMMEDIATE DENTURE SERVICE

By E. Byron Kelly, D.D.S., Chicago, Ill.

THROUGHOUT the land, immediate restoration of the natural teeth continues to be practiced by the members of the dental profession. The popularity of this method of restoring teeth without a long period of waiting has grown rapidly in the last ten years.

I presume our fathers did it [immediate plate work] before we were born.[1]

Teeth which are removed . . . should be immediately replaced before the patient leaves the office.[2]

While there has been an increase in the number of men practicing this service, it should be noted that the leading authorities on this subject appear to be far from an accord on the technical procedure involving the removal of all the natural teeth and the insertion of a restorative appliance.

In reviewing the literature and observing clinical demonstrations, it is noted that much confusion exists regarding the entire service, particularly as to mouth preparation. Many dentists, often supported by the oral surgeon, contend that the success of any full denture restoration depends, first, on the removal of all apparent infectious areas and, secondly, the reduction of any physical prominence and the elimination of undercuts, in order to establish uniformity of the ridge tissue.[3, 4]

On the other hand, the majority of published articles hold to the theory that the conservation of the hard tissue in the mouth is least distressing to the patient and ultimately terminates in greater security and stability for the appliance.[5, 6, 7]

Efforts made in early experience in this field, or . . . resorts to removing such areas surgically, have, on afterthought, been discontinued.[8]

After extraction, the alveolar ridge tissue usually continues to recede for a year and a half.[9]

I do not favor spectacular surgery. One should guard against it.[10]

Teeth and nothing but teeth are to be removed. The best surgical preparation of the mouth is no preparation. . . . It is common practice to remove all posterior teeth prior to taking impressions for immediate replacement. This is not necessary. . . . Tissue change underneath these dentures is inevitable.. . . .[11]

Another debatable point arises from a "piecemeal" extracting practice in which the molars and bicuspids are removed first, and later, when the denture is ready for insertion, the anterior or remaining teeth are removed.[12, 13]

While these discussions are going on among proponents of immediate restorations, thousands of dentists are continuing to remove the teeth and wait until "the gums harden" before constructing the first denture. Of course, with one group of dentists telling patients "You should never go even a day without teeth," and another group, equally positive, "wait until the gums harden," it is easy to understand the dilemma of the person seeking professional advice.

There should be some consolation for the delayed-service sponsors, however, for nearly every one of the medical com-

Read before the Section on Full Dentures at the Seventy-Seventh Annual Midwinter Meeting of the Chicago Dental Society February 18, 1941.

mentators for the press answer inquiring patients with "Wait—three months is good, six months is better."

It has always been my contention that the chief objection to immediate denture service is not any physiologic or health consideration, but the economic aspect. Our patients are not educated to the point where they can understand that changes in appliances must be made to conform to the physical changes in the mouth. Extensive breaking down of the ridge structure beneath the first dentures often necessitates an entirely new restoration, and it is this annoyance and the expense to the patient that often cause him to question the judgment and ability of the dentist; and, as a consequence, many men hesitate to attempt this class of service.

Fig. 1.—Set-up for immediate denture, teeth "butted" to gums with front opening, reducing possibility of swelling and edema.

There is not the slightest doubt in my mind that the most successful denture cases are those in which the patient has never experienced the inconvenience of going without teeth, and there is always danger in permitting a patient to acquire the bad habits which are so noticeable in the toothless victim. To allow a patient to go without teeth and acquire unnatural habits which can only result in facial distortion is, in my judgment, a questionable practice.

Presuming, then, that immediate denture service has a place in dentistry, and that it should be practiced in the majority of cases, it becomes our duty to cause the patient as little distress as possible when the teeth are removed, for maximum comfort and service during the period of functional training and adjustment to the appliance.

In order to attain this objective, the teeth should be removed with as little surgical injury to the supporting structure as possible. We may fail to eliminate every rarefied area or focus of infection, and there may be undercuts; nevertheless, these conditions, with rare exceptions, can be corrected later without danger to the life or health of the patient or the necessity of costly changes in the denture.

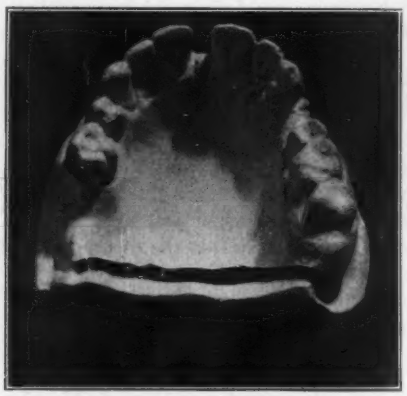

Fig. 2.—Molars and bicuspids retained with anterior teeth for uniformity of tissue recession.

Extensive surgical procedures—resectioning, curetting, etc.—increase the injury to the parts, and, as a result there is augmentation of the blood supply, accompanied by swelling and often followed by a noticeable edema. Particularly is this true when the injured parts are encased in a denture which has been constructed from a cast produced from an impression taken when the soft tissues were in normal condition. Fewer complications will follow the practice of making upper dentures with "butted"

gums. By providing this open front, we have what I term "a breathing spell" for the tissues. (Fig. 1.)

In the technic presented here, I prefer to retain the molars and bicuspids and have them removed at the same time as the anterior teeth. Of course, abscessed teeth and roots and teeth which invite complications should be removed early. (Fig. 2.)

The reason for this procedure is that there will be greater uniformity of tissue recession or breaking down under the masticating stress of the denture. If the molars and bicuspids have been extracted and the ridge tissue has been permitted to heal and become firm naturally, and the denture has been inserted immediately following removal of the anterior teeth where the ridges are necessarily weaker, there will be a more rapid breaking down, resulting in unequalized resorption.

In the construction of a denture to take the place of the teeth to be removed, it is important that we retain, as far as possible, the forms and shades of the natural teeth. The vertical dimension and mandibular movements also should be in conformity with the normal or long-acquired conditions of the patient. One point that I should like to stress here applies to all denture cases: No attempt at radical changes affecting the masticating habits established through years of muscular training, or

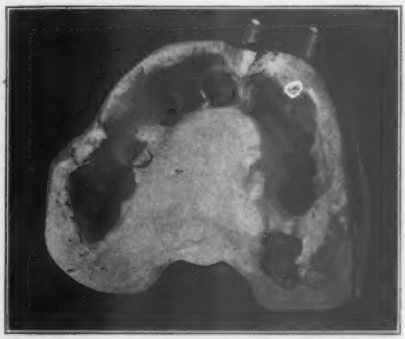

Fig. 3.—Impression taken with hydrocolloid material, which records accurately mouth and teeth arangement.

Fig. 5.—Elastic mold; manner of encasing hollow metal beads in cast when palate is high, insuring closer adaptation to roof of mouth.

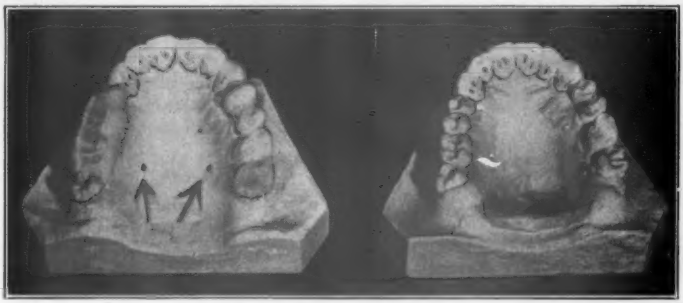

Fig. 4.—Casts. Left, missing spaces filed with stone for carving. Right, teeth carved to shape of natural teeth.

opening of the bite, should be made simply because we believe that mastication should function fully or that we are admirers of beauty.

Remember: We have two hands and arms, and if some idealist desires to sell us the idea (if we are past the age of 40) that we must begin training to make our left hand as efficient as our right, we should not let him induce us to attempt to overcome years of training in an effort to acquire the bilateral skill of a magician.

The first requisite of a successful denture is "comfort," and let us bear in mind too that no force destroys the ridges and gum tissue so quickly as an equalized concentric occlusal balance with an eccentric articular condyle center of rotation.

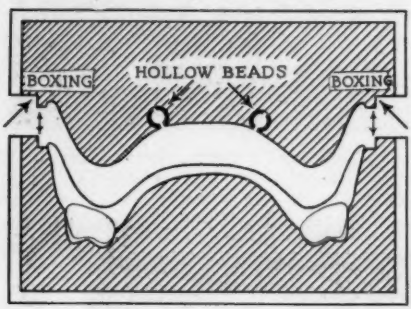

Fig. 6.—Cross-section of mold (Fig. 5) as it appears in flask.

Returning to consideration of the building of an immediate denture of this character, it may be stated that it is possible to construct the appliance in such a manner as to reproduce every detail of the natural tooth form and to give a lifelike color to the teeth by the use of organic plastic material.

Plastics, which may be defined as material capable of being molded, are not new in dentistry, but many new organic plastic compounds possessing outstanding chemical and physical properties are of recent creation.

In order to have a clear understanding of organic plastics, it is well to refer to the general classification: 1. Thermoplastic. A thermoplastic possesses the properties of being molded and remolded by the application of heat. This treatment of the material is referred to as processing. 2. Thermosetting. Plastics of this class may be molded either cold or with heat, but, when subjected to heat after being placed in a mold, the material becomes "set" and cannot be reshaped without a structural breakdown. This change from a soft to a hard form is termed "curing." (Many authorities use the term "curing" in referring to hardening method, whether the materials are thermoplastic or thermosetting.)

I name only a few materials under these two classes. Under thermoplastic, we find cellulose nitrate and the more modern cellulose acetate, vinyl resins and, later, the acrylic materials. Under thermosetting materials, the bakelite and other phenolic compounds have been our chief interest.

Fig. 7.—Mix of soluble stone or plaster, forming tooth part, while 40-60 mix of regular stone and plaster completes cast.

In the denture construction technic to be described here, the material used is methyl methacrylate or, as it is commonly referred to, "acrylics."

TECHNIC

Before taking the impression, the third molars, roots and badly broken down teeth are removed and the parts allowed

to heal. Cavities should be filled with temporary cement to maintain the form of the tooth and prevent "dragging" with the impression. Heavy deposits on the teeth are also removed.

Impressions are taken of the mouth and teeth with a large-sized tray, using only a good hydrocolloidal material. It is important to record high cervical margins. (Fig. 3.)

From this impression, a cast is immediately poured in stone. As a general rule, it is better to construct only one denture (either the upper or the lower) at a time, and if there are sufficient teeth remaining to insure a balance for the denture, the mounting of casts on the articulator is optional.

The next step is the filling in of the

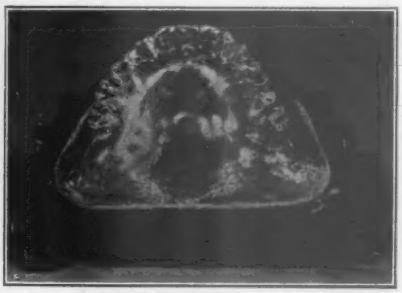

Fig. 8.—Soluble teeth coated first with floor wax and waxed case completely covered with 0.002 gage tinfoil.

missing tooth spaces on the cast. This is done by simply adding a fresh mix of stone and carving it when hard to approximate the forms of the natural teeth. At this time, it is advisable to deepen the cervical lines about the teeth and correct any errors appearing on the cast. (Figs. 3 and 4.)

This cast, with a full complement of teeth, now becomes what is known as the master cast, from which one or more duplicates can be made. Duplicates can be obtained by using a hydrocolloid with a pressure gun. Casts can now be poured into these molds, but it is necessary to have a special technic.

1. Hollow metal beads about 5 mm. in diameter are attached with part of a pin or sticky wax to the duplicating mold. Two or more beads may be used, one on each side, the favorable position being about one-half inch anterior to the posterior palatine line, and half way between the ridge and the center of the palate. These beads are intended to secure a close adaptation of the denture base material to the cast. When the duplicate cases are poured, the beads become firmly embedded in the stone or plaster. (Figs. 5 and 6.)

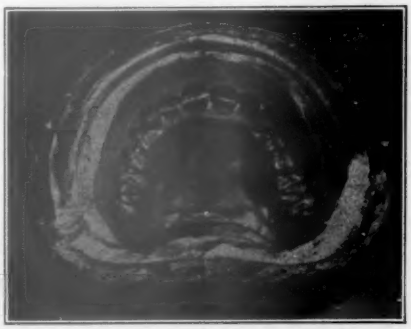

Fig. 9.—Tooth side of flask after soluble teeth and wax have been removed by boiling.

Fig. 10.—Commercial plastic teeth used to correct pronounced irregularities or close conspicuous tooth spaces. Cervical lines indicate the part of cast to be cut away.

2. With the beads in position, a small mix of soluble stone or plaster is prepared and vibrated into the tooth section of the mold. Care must be exercised to

avoid spreading the soluble plaster to other parts of the form. When the tooth section becomes set, a mix of stone and plaster (40-60) is added to complete the cast. (Fig. 7.)

This duplicate cast, with soluble teeth and insoluble base, is now ready to be waxed, foiled and invested in a flask. Before this is done, it is necessary to deepen the cervical margin lines around the anterior teeth, and a deep postdamming line must be cut in order that the denture may have a tight palatine seal.

Two methods of all plastic denture construction are illustrated here: making the tooth parts, first, by the mixing and combining of tooth-colored acrylics; second, by using stock molds or manufactured plastic tooth forms. By either method, or by combining the two, it is possible to obtain very satisfactory results.

Returning now to the prepared cast: If the teeth are uniform and no changes are necessary in tooth alinement, the soluble teeth are coated with floor wax and allowed to dry. Waxing the case comes next, and finally tinfoil (0.002 gage) is used to cover the entire case, the teeth as well as the waxed base. (Fig. 8.)

Investing in the flask is done in the usual manner, followed by boiling and separating.

Boiling the case causes the soluble teeth to break down and the floor wax

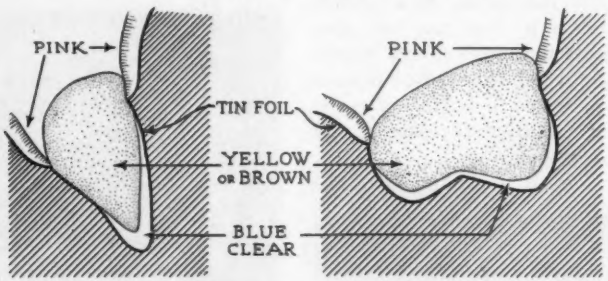

Fig. 11.—Manner of packing tooth-colored material during flasking.

Fig. 12.—Semisolid "biscuit cake" of acrylic form removed from vaseline-coated tooth spaces to permit trimming of material for better tooth form.

between the foil and teeth permits a clean removal of the remaining parts of the soluble material from the matrices formed from the teeth. (Fig. 9.)

Before describing the method of forming the tooth part of the denture, let us refer to the second method, the use of manufactured plastic tooth forms. These teeth are particularly applicable where the natural teeth are out of line or spaced, or in cases of extreme "closed bite." In cases of this kind, the soluble plastic teeth are cut away one at a time and the plastic teeth cut, shaped and placed in the desired position in the cast. (Fig. 10.)

If plastic teeth are employed in constructing the denture, it is not necessary to foil the teeth in flasking, but a thin mix of plaster should be first applied and allowed to stand before completion of the investment.

When commercial plastic teeth are used and the case is flasked, separation is made in hot, not boiling, water. The wax is removed with very hot water, or xylene may be employed. Chloroform or like solvents should never be used with plastic or acrylic teeth.

With manufactured plastic teeth, the case is processed in the usual manner of any acrylic packed denture but the pink

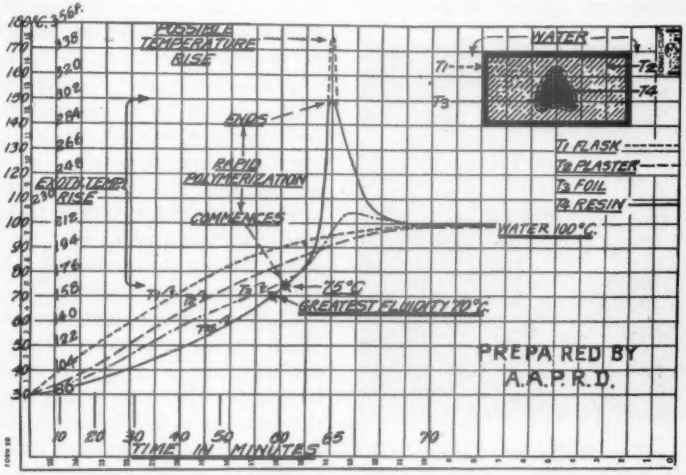

Fig. 13.—Temperature-time-processing chart prepared by special committee from American Academy for Plastics Research in Dentistry, under direction of W. F. Bartoe, physicist, Rohm and Haas Co., Philadelphia, Pa.

There is one distinction to be noted here between plastic teeth and the porcelain forms. With the former, depressions to approximate the tooth socket which is to follow are cut deep into the cast, as it is much easier to remove "high spots" in the finished denture when plastic teeth are used than with porcelain teeth, and the tooth structure is not weakened by any pins or diatoric undercuts, which are necessarily a part of porcelain teeth.

material mix must not be too thin or "watery."

Tooth-colored acrylic resins are now available for this work. The preparing and packing of the case may be described as follows:

1. The tooth molds of the flask are cleaned thoroughly.

2. A coating of vaselin is applied to the tinfoiled tooth molds.

3. Two mixes are prepared, one for the tip and one for the base of the tooth.

The proportion of the mixes should be 28 grains of powder to 1 cc. of the liquid. The material is mixed thoroughly, air volatilization being avoided as much as possible. The jar is closed and allowed to stand until the mass reaches a thick putty-like consistency. Usually, the material is in good working order in about one to two hours, and it is possible to retain this putty-like form overnight if the material is sealed tightly and kept in an icebox.

4. The tip of the tooth is packed with the lighter shade and the darker base shade is added to form the body of the tooth. An excess of material must be used and pressure applied for condensation. (Fig. 11.) A piece of thick white felt with wet cellophane may be used for this purpose.

Fig. 14.—Zinc oxide-eugenol paste applied in denture after adjustment to alleviate pain, control bleeding, keep parts clean and add to comfort of patient.

5. Now, the case is allowed to stand until the plastic becomes quite stiff (usually a half to one hour), then the entire block is carefully removed from the vaselined mold. The acrylic block may be taken out and returned several times to assure that it will go to position after exposure to air, and is then dried thoroughly. (Fig. 12.)

6. This tooth formed block, when semihard, is cut and shaped around the cervical parts of the tooth in such a manner as to produce a uniform gum line when the pink material is added.

7. With the block form of teeth carved and seated in position, the pink is packed around the forms and the case trial-pressed with application of liquid heat, not to exceed 110°F.

8. Slow processing is very important, especially in the beginning, as all acrylic materials where a monomer and a polymer are used require an exacting technic in order to assure accuracy in finish and condensation. A glycerine bath is preferred in this processing because it maintains a uniformity of heat above the boiling point of water.

9. Finishing and polishing of all acrylic dentures require more care than with porcelain, and while this is easily assured, plastic teeth must not be subjected to frictional heat or weight treatment.

The teeth, which form the intricate part of all acrylic dentures, may be more individualized by the use of color stains after the case is completed.

The temperature-time-processing chart (Fig. 13) was prepared by a special committee from the American Academy for Plastics Research in Dentistry under the direction of W. F. Bartoe, physicist of Rohm and Haas Company, Philadelphia, Pa.[14] This draft represents changes occurring in acrylic resins during processing, recording the temperature registration of the flask and the contents. Water is used, with the application of heat and pressure at the rate of one degree centigrade per minute.

The important point to note is the action of the insulated mass of plastic material as the temperature of the water increases. When the mass reaches 70°C. (158°F.), the material is soft and jelly-like, but, in five minutes more (75°C.), rapid polymerization sets in and the resin begins to harden. In ten minutes after this action begins, 95 per cent of poly-

merization is completed, and any force which may be applied to compress the plastic thereafter will result in the incorporation of strains in the finished product.

Attempts to quickly process acrylic dentures, especially if considerable material is required for the case, usually result in porosity or void surface spaces.

Where acrylic base material is used for dentures, the dentist should employ low, slow heat, taking at least sixty minutes, starting at 86°F., to reach the temperature of 170°F.

When the case has reached the boiling point of water, twenty minutes should be allowed before turning off the heat. Bench cooling of the flask may be employed when the bath temperature returns to 150°F.

While this chart is intended only as a guide, it should be remembered that many conditions are possible which alter the action indicated. The amount of plastic used, the proportion and consistency of mix and the form of the mold have a marked bearing upon the heat generated by the mass of plastic.

Removing the flask from the bath and tightening the bolts are also factors in temperature change.

The next procedure in the immediate denture service consists in extracting the natural teeth, the preliminary trying-in, removing the denture impingements and checking the articular balance.

The denture is now ready to be seated securely in the mouth. This is done by using a zinc oxide eugenol paste. The paste used should be of a high non-toxic clove oil content, which insures a decided anodyne response, with the usual hemostatic properties of the material.

If the paste is white, a little lipstick may be added to a part of the mix for a tissue tint, and applied at the gum butted area of the denture.

A fresh mix of this temporary surgical lining may be added from time to time as the gums recede, but, in many cases, the denture will gradually become seated with an equalizing balance.

It is rather interesting to note that once a patient becomes accustomed to these natural tooth formed all-acrylic dentures, with the light weight, nonglasslike feeling, etc., it becomes a problem to change to the porcelain tooth appliances.

With more than two years of observation, involving many cases, I am of the opinion that nothing in full denture construction will give so much confidence, satisfaction and service as these exceptionally strong, light-weight dentures designed entirely from acrylic resins.

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55 East Washington Street.

ZINC PEROXIDE IN THE TREATMENT OF MOUTH INFECTIONS

By Stephen P. Mallett,* D.M.D., and Walter C. Guralnick,† B.S., D.M.D.,
Boston, Mass.

In 1935, Meleney[1] wrote his first paper on zinc peroxide. The drug came to our attention through its use at the Boston City Hospital as a postoperative pack in cases of Ludwig's angina. In talking with members of the surgical staff, we were impressed by the reports of the successful use of zinc peroxide in combating anaerobic organisms. Since that time, we have observed the effects of zinc peroxide therapy in various types of mouth infection. Having used the drug for the past three months, we are convinced of its value in dentistry and here report its use in the treatment of a number of mouth infections.

Meleney originally used zinc peroxide in surgical infections.[1] For some time, the treatment of large foul, progressive ulcerations of body surfaces had perplexed medical experts. Meleney, working on the treatment of these lesions, first determined that the bacterial content of the wounds was rather peculiar, the predominant organism being an anaerobic streptococcus, which he called the "micro-aerophilic streptococcus." The treatment of wounds infected by these anaerobes, he decided, should consist of the use of an oxygen-liberating drug. Several of those in use were tried, but all failed in the one fact that they liberated oxygen very rapidly and were inactive and useless within a few minutes. Their action, then, was too transitory. With this in mind, he asked two biochemists, Hans Clarke and Edgar Miller, to "suggest a peroxide that would yield its oxygen over a relatively long time, rather than give it off abruptly. After some deliberation, Dr. Clarke suggested zinc peroxide.[1]" This chemical, once merely a bleaching powder, was found to have amazing ability to clean up foul infections.

In studying the action of the chemical *in vitro,* Meleney found that "when zinc peroxide is added to a broth culture containing cooked meat (which gives a peroxidase reaction), the micro-aerophilic hemolytic streptococcus may survive six or seven days, but it finally succumbs."[1] It appears that the lethal anaerobic streptococcus is changed into a harmless aerobic green streptococcus by the action of the drug. Some of the pure anaerobes, moreover, seem to be destroyed by the drug.

Meleny also reports its successful use in *Cl. welchii* infections, as well as in infections with the Plaut-Vincent fusiform bacillus and the spirochete. "In general, it may be said that the more strict the organism is in its anaerobic requirements, the more susceptible it is to zinc peroxide."[2]

Having ascertained the value of zinc peroxide, Meleney suggested its use in neck and mouth infections. He indicated its use in foul-smelling face or neck infections of dental origin and mentioned its possible use for dental prophylaxis as well as in dental infections.[3]

Guided by Meleney's report, we proceeded to use zinc peroxide in many cases of severe Vincent's stomatitis, cellulitis of the jaw with foul-smelling extraction wounds and also pericoronal

*Oral surgeon-in-chief, Boston City Hospital.

†House officer in oral surgery, Boston City Hospital.

flap infections, with results that were very satisfactory, and, in some cases, even dramatic. The response of pericoronal infections to treatment has been particularly gratifying. The case of a man aged 44, white, who was referred to us by another hospital for the removal of an impacted lower left third molar affords a good example of the action of zinc peroxide.

REPORT OF CASES

CASE 1.—When seen in the clinic, the patient had a swelling of the lower left side of the face with very marked inflammation and edema of the mucous membrane posteriorly from the second molar tooth. The third molar had not erupted through the tissue, but there was a deep pocket just distally from the second molar and into which an explorer could be dropped about 3 mm. before it struck the crown of the third molar. The patient complained of suffering for more than a week from "soreness" of the gum in the third molar region. He said that the pain had been so great that he had been unable to sleep for several nights. A fine scaler was carefully passed into the soft tissue flap and some débris removed. The area was then gently irrigated with a sterile saline solution for purposes of débridement. A small wick saturated with zinc peroxide powder was now placed in the pocket, and zinc peroxide powder was gently "dusted" over the whole area of the gingivae in the region of the unerupted tooth. The patient was instructed to refrain from rinsing the mouth until about four hours after the treatment; to use only warm saline mouth washes hourly thereafter, and to return on the following morning.

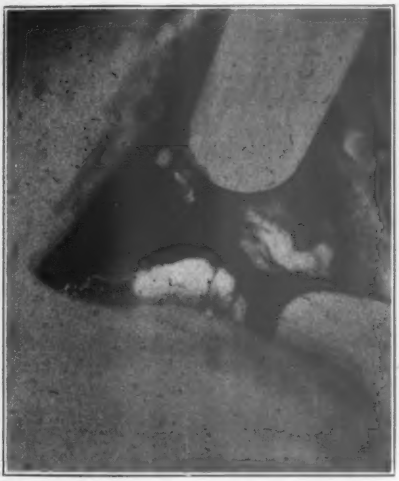

Fig. 1 (Case 4).—Necrotic ulceration of buccal mucous membrane before treatment with zinc peroxide.

At the time of the second visit, the relief and improvement were remarkable. The patient said that he had enjoyed his first night of rest and relief from pain. Examination revealed marked improvement in the appearance of the gingival tissue, there being less inflammation and almost no swelling.

Fig. 2 (Case 4).—Healed ulcer in buccal mucosa after treatment with zinc peroxide. Four applications of the drug had been used when this picture was taken.

The wick was removed and no longer used. The application of zinc peroxide powder was repeated at this time and again two days later. The day following the last treatment, the impacted molar was removed, without postoperative complications.

This one case is illustrative of the excellent results we have had in using zinc peroxide in the treatment of acute pericoronitis. The drug has also proved its worth in treatment of Vincent's stomatitis. The following two cases are typical of many successfully treated with zinc peroxide.

CASE 2.—C. B., a girl, aged 16, white, first seen July 26, complained of pain and bleeding of the gums. The mouth showed a typical Vincent's infection: a fetid odor, sloughing of papillae and inflammation of the gingivae throughout. July 28, the patient received the first application of zinc peroxide. At this time, we were using the drug in solution with sterile water. The solution was made into a creamy suspension and applied to the gums with a syringe. A smear taken July 26 was found to be positive for Vincent's organisms, confirming the clinical picture. The zinc peroxide treatments were repeated August 1, 3, 4 and 5. August 6, the patient was discharged as cured, the gingivae no longer being inflamed or showing necrosis of the papillae. The breath was no longer foul. There was no pain or discomfort. In all, the girl was seen at the clinic on eight occasions, receiving zinc peroxide six of these times. She was given a small quantity of the powder to use at home each evening, while she was under treatment. She made her own solution with ordinary tap water, using cotton swabs for applications of the zinc peroxide solution.

No other drug or agent of any kind was used. Prior to reapplication of zinc peroxide, the mouth was thoroughly irrigated with saline solution to get rid of the zinc oxide residue of the previous treatment. The only other precaution was advice to the patient to increase the vitamin C intake by drinking the juice of six oranges daily.

CASE 3.—E. D., a white man, aged 25, first seen at 10 p.m., September 15, in the emergency ward of the hospital, was extremely thin and pale and obviously in distress. He complained of severe pain throughout the mouth, stating that he had been suffering for a week from severe pain in the gums. He had been unable to eat or sleep. Examination revealed a particularly foul condition of the mouth. The patient had never had his teeth cleaned or filled by a dentist, having been to a dental office on just a few occasions when he had toothache requiring extraction of broken-down teeth. He had not brushed his teeth for the past nine years. The mouth odor was extremely foul. The gums were so tender that the patient resisted examination when we attempted to lift the upper lip. There was a classical grayish slough of the marginal gingivae, with inflammation of the mucous membranes throughout the mouth.

The patient was given a sedative for the night and was seen as an outpatient the next day, at which time, with all other signs and a positive Vincent's smear, he had a fever of 99.4°F. The appearance of the mouth and the physique of the patient were such that a medical consultant was called in to rule out a vitamin deficiency syndrome or a blood dyscrasia. The physician agreed that the patient was poorly nourished but showed no marked vitamin deficiency. Blood studies were negative for leukemia or any other blood dyscrasia. Zinc peroxide therapy was begun, the drug being applied in powder form. However, previous to the initial application of zinc peroxide, September 16, the slough was carefully cleaned off the gingivae. Also, the more readily accessible calcular deposits were removed from about the necks of the teeth with a fine scaler. No "deep" scaling was attempted in the presence of the massive infection in the mouth, but the mouth was so filthy that it would have been folly to expect any drug to clear up the Vincent's infection without eliminating from the mouth some of the foreign material present.

The patient, when seen the following day, showed some improvement. The mouth odor was less offensive; the inflammation of the mouth had subsided to a marked degree; the slough was much less extensive than on the previous visit, and, most important of all, the patient said that he had suffered very little pain and had enjoyed rest for the first time in a week.

Careful scaling was carried out, the mouth was irrigated with saline solution and zinc peroxide powder was applied. Three applications of the drug were made and, on the fourth visit, the mouth was clean enough to permit extraction of a broken-down upper right first molar root. There were no postoperative complications.

In all, the patient was treated in the clinic on six occasions, and by that time an appreciable difference was noticeable in the mouth. There was no longer sloughing or marked inflammation present. There was some gingivitis, but remarkably little considering how far advanced the infection of the mouth had been. When last seen, three

weeks after treatment was initiated, and after an interval of more than a week since the last visit, the mouth looked well, was little inflamed and had no odor, but still showed marks of poor oral hygiene. It would not be possible to clear up the mouth condition of such a "dental cripple" with any drug, diet or other device. However, the action of zinc peroxide, in actually clearing up a painful, foul infection to the point of comfort and improved appearance in two or three days is indicative of the effectiveness of the drug.

For home care, the patient was advised to take two 50 mg. tablets of ascorbic acid morning and night; to refrain from smoking and from drinking liquor; to clean the interproximal spaces with cotton wrapped on a toothpick, and to apply zinc peroxide powder to the gums twice daily.

CASE 4.—A woman, white, aged 49, developed an ulceration of the buccal mucous membrane, following extraction of the teeth and alveolectomy of one quadrant of the upper arch. (Fig. 1.) The patient presented a foul-smelling, sloughing, necrotic ulceration three-quarters inch in diameter, in the right cheek. In the center of the ulcer was a draining sinus from which a thin purulent exudate could be expressed. A probe passed into the sinus could be carried up into the cheek tissue for a distance of about 1½ inches. The ulcer had the foul odor distinctive of infections with anaerobic organisms. There was considerable swelling of the whole cheek, and digital examination revealed in the right maxillary region an indurated area about the size of a 50 cent piece. The loose slough was first carefully picked off the ulcer. With a small-nozzled syringe, the sinus was then irrigated with zinc peroxide solution, the ulcer itself finally being covered with zinc peroxide powder.

The patient had suffered considerable pain and discomfort up to the time of this visit, but, when seen the following day, she volunteered the information that her pain had been relieved. The ulcer was decreased to one-fifth its former size and was no longer so foul smelling, nor was there much further slough. At this visit, the sinus and ulcer were irrigated with warm sterile saline solution, and the zinc peroxide treatment was repeated. In all, the patient had four applications of zinc peroxide over a period of one week. The home care consisted only of warm saline irrigations. At the end of a week, she called to say that she was well. She was not seen again until one week later, at which time she was completely recovered. The ulceration was entirely healed; the sinus was closed; the indurated swelling had diminished to about the size of a pea, and even this area cleared up in two more days. (Fig. 2.)

Still another condition in which we have used zinc peroxide is infection of the socket following extraction, especially of lower molars. In some of these cases in which there has been a postoperative cellulitis, zinc peroxide irrigations have helped to control the infection. One notable fact which we glean from its use is the ability of the drug to dispel the very disagreeable odor characteristic of mouth infections. Even one or two applications of zinc peroxide result favorably; which probably indicates a reduction in the anaerobic infection.

One more important use of zinc peroxide, suggested by Meleney, is its employment as a preoperative prophylactic mouthwash. It has been the rule at our clinic to use metaphen 1:2,500 as a mouthwash before operating. The patient is told to rinse the mouth for five minutes with the metaphen solution, to reduce the number of bacteria in the mouth, but this fails to affect the anaerobic organisms appreciably. In zinc peroxide, made into a solution with sterile water or hydrogen peroxide, we have a mouthwash that effectively combats these anaerobes. Usually, 1 part of powder is mixed with approximately 4 parts of water, and the resultant solution is given to the patient to be used as a rinse. We have used zinc peroxide in this way before certain operations and prior to wiring fractured jaws. The rationale of the use of this drug preoperatively is good, and its use as a prophylactic mouthwash should prove its worth in time.

As to the actual application and use of zinc peroxide in the mouth, the chem-

ical must first be activated by sterilization in an oven with dry heat at 140°F. for four hours, and quantities of more than 50 gm. should not be treated at one time if the whole mass is to be affected. At the Boston City Hospital, we are able to obtain the activated product from a central laboratory serving the entire hospital, and thus the problem of sterilization is obviated. Meleney used the drug clinically, and suggested several methods of its use. He used it in a suspension of 1 per cent gelatine and also in a 5 per cent pyrophosphate solution.[1]

Finally, it was found that oxygen liberation and production of hydrogen peroxide are dependent on the presence of water, the zinc peroxide being much more bactericidal in water suspension than in oil. "Therefore (they) applied it only suspended in sterile distilled water and have sealed the dressings so as to prevent evaporation."[2] The powder was mixed with sterile water to a point where a suspension of about the consistency of 40 per cent cream was obtained. We originally followed Meleney's suggestions, but soon found that when used as a solution, zinc peroxide was too quickly washed away or too greatly diluted by the mouth fluids. We then began to use the drug as a dusting powder, merely applying it to the tissues with cotton applicators. We have found this to be the most suitable method for use in the mouth, the patient's own saliva being fluid enough to put the zinc peroxide into solution, with resultant liberation of oxygen.

From our observations, this method seems best, in that the powder can be applied liberally wherever desired and seems to be less quickly removed. A point very much in favor of the use of the drug, whether in solution or as a powder, is the fact that once its oxygen is liberated, zinc peroxide is just inert zinc oxide. The perfectly bland end-product is one of the most important attributes of the drug, for, after its action, it can do no harm, even if ingested. However, if the residue, zinc oxide, is not carefully removed before a second application of the drug, it will act as any other foreign body and prevent healing. Therefore, it is important that saline irrigations be used before application of zinc peroxide. In this way, the field is cleaned up so that a new application of the drug becomes effective.

After using zinc peroxide in more than fifty cases of various types of mouth infection, we are convinced of its value. It has been used successfully in treating the following types of cases: (1) the presence of pericoronal flaps about partially erupted third molar teeth; (2) Vincent's stomatitis; (3) ulceration of the mucous membranes, and (4) necrosis of the socket following extraction. It is also used as a mouthwash in preparation of the mouth for surgical procedures.

The drug recommends itself particularly because of its chemical action, its inability to damage mouth tissues and its ease of application. We owe a debt of gratitude to Dr. Meleney for demonstrating to us the use of zinc peroxide. In our work, we have become convinced of the value of the drug. We make no exaggerated claims for it, but rather consider it a valuable addition to the armamentarium of the practitioner.

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358 Commonwealth Avenue.

REVIEW OF ODONTOMA, WITH CASE REPORT

By Lewis E. Nolan, M.D., M.S., and C. L. Kennedy, D.D.S., Montgomery, W. Va.

THE LITERATURE

A SOFT odontoma of composite structure is rare. Perthes[1] described a soft odontoma made up chiefly of connective tissue containing many rudimentary teeth. Schlossmann[2] reported a tumor in the lower jaw of a 10-year-old boy, with the structure of firm connective tissue, containing numerous small, hard formations as large as peas, and histologically composed of well-formed enamel organs surrounded by layers of dentin in various stagēs of development.

Hard odontomas, although not common, are found with much greater frequency than soft odontomas. Geschickter[3] and Copeland, in a survey of 323 tumors of the jaw, found five cases of odontoma. In this material, he cited a case of composite odontoma occurring in the mandible of a 14-year-old boy. The tumor contained small calcified bodies and several small imperfectly formed teeth having a fibrous connective tissue stroma between them and containing a few strands of compressed enamel epithelium.

In Forget's[4] case, the odontoma was composed of irregular masses of dentin and enamel and pulp canals covered by a layer of enamel. Uskoff[5] reported an odontoma composed of masses of dentin and bone. Krogius[6] reported an odontoma composed of dentin and cementum with traces of enamel. Robin[7] described a complex cystic odontoma which contained three well-formed molar teeth in adjoining cysts and two rudimentary teeth rooted in bone and projecting into small cysts. Tapie[8] reported a composite odontoma with several teeth fused by cementum lying free in a cyst in the angle of the jaw. Buechele[9] successfully removed from the mandible an odontoma containing eleven malformed teeth shaped like canines and premolars. Corless[10] reported a complex composite odontoma in the right lower jaw, with successful operation, in the case of a man 27 years old. Crecca[11] removed a complex composite odontoma made up of enamel, dentin and cementum, with enamel predominating. Gullifer[12] described composite odontoma of the left maxilla made up of hard nodular masses of enamel, dentin and cementum. Kazanjian[13] removed a large odontoma of the right mandible made up of amorphous tissue, probably enamel substance. Ewing[14] called this type amorphous odontoma. Rushton[15] described nineteen specimens of dilated composite odontoma. Schultz[16] removed a composite complex odontoma of hard structure from the left side of the mandible. Straith[17] reported in a woman 30 years old an odontoma of the mandible made up of irregular hard bony masses of ebonated bone and dentin.

HISTORY

Paul Broca[18] first employed the term "odontoma" in 1867, but such tumors had been described previously. In 1931, Sidney Spokes, when excavating a round barrow of the Bronze Age (1800-500 B.C.) on the Downs near Lewes, found a small calcified odontoma in the jaw of a young female. Herodotus[19] described a skull found at the battle of Plataea, 479 B.C., in which each jaw contained teeth fused in a mass, composed of dental tissues without interstices. Bordenave,[20] in 1774, published a case of calcified

From the Laird Memorial Hospital Tumor Clinic and Department of Surgery.

osseous tumor of the mandible which appeared to be a calcified odontoma. Jourdain,[21] in 1778, reported three cases of dentigerous cysts. In 1782, Fauchard[22] reported a "petrified epulis of calcified structure." A symmetrical calcified mass composed of incomplete crowns of incisors and canines was observed by Oudet[23] in a young man in 1809.

CLASSIFICATION

The following modification of the British Dental Association's classification of odontomas is most useful both to the surgeon and to the pathologist:

Fig. 1.—Tumor of left maxilla before operation.

Fig. 2.—Front view of deformity produced by odontoma.

3. Epithelial odontomas
   - (a) Adamantinoma
   - (b) Dentigerous cyst
   - (c) Dental cyst

B. Composite odontomas
   - (a) Complex composite odontoma
     Compound composite odontoma
   - (b) Geminated composite odontoma
     Gestant, composite odontoma
     Enamel nodules
   - (c) Dilated composite odontoma

C. Connective tissue odontoma
   - (a) Fibrous odontoma
   - (b) Cementoma

The abnormal development takes place in the dental epithelium in the epithelial odontomas. The term "composite odontoma" is used to include all odontomas in which the abnormal development takes place primarily in the dental epithelium and secondarily in the dental papilla and follicle. The complex composite odontoma consists of a conglomerate mass of tooth structures: enamel, dentin and cementum, with tooth structure shown in the microscopic sections. The compound composite odontoma is an encapsulated tumor containing numerous teeth or denticles consisting of enamel, dentin or cementum. The many small enamel organs that are formed instead of a single normal enamel organ may be separate in the cavity or fused. They develop early in life and are usually associated with unerupted teeth. In geminated composite odontoma, there is fusion of two or more teeth combined with malformations, such as masses of cementum and dentin.

In gestant composite odontomas, a denticle is contained within the walls of a tooth. Enamel nodules are globular masses of dentin covered by enamel situated usually at the junction of the buccal roots of maxillary molars. Dilated composite odontomas are those in which the abnormal development of the dental epithelium results in the formation of a dilated portion of the dental papillae that is calcified as one mass. A connective tissue odontoma is due to aberration of the tooth follicle, the abnormal development taking place in the dental tissues of mesoblastic origin. The two varieties are cementomas and fibrous odontomas. The cementomas are made up of solid, irregular formations of cementum that may develop about the crown or roots of a tooth that eventually erupts or that may surround an immature erupted tooth. The alveolar plates are expanded by the enlarging masses. The fibrous tissue of the follicle proliferates in the odontoma. There may be a calcified mass in the center of the tumor, composed of concentric layers of white fibrous tissue. The cementoma is formed by conversion of this tissue into cementum, or may be formed as a result of extreme overgrowth of cementum.

Fig. 3.—Front view; showing density and deformity in left maxilla.

PATHOGENESIS

In a broad sense, all tumors that develop from the anlagen of the teeth or from paradental rests are called odontomas. Such tumors develop within the bone of the jaw and cause expansion. They vary from hard, slowly growing structures, composed of dentin and enamel, to rapidly growing soft infiltrating epithelial tumors. The classic study of Malassez[25] simplified the entire subject by referring most of the tumors to embryonal remnants of the enamel organ. He described in the fetus numerous cell growths scattered along the borders of the teeth from apex to crown and divided them into: (1) superficial cells lying just beneath the gingival epithelium; (2) intermediate, lying along the sides of the tooth, (3) and deep, connected with the enamel organ. The cells vary considerably in structure. In the superficial, there are round cells encircled by cylindrical cells. There are groups of cells about the enamel organ that are transitional between cylindrical enameloblasts, round cells and stellate cells. Many of these cell groups persist in the adult and are interpreted as analogues of the rich dental apparatus of some lower vertebrates and as giving rise to the supernumerary teeth of the so-called third dentition. These are derived from invagination of the gingival epithelium, which forms the enamel organs. The paradental epithelium is the source of the entire group of cystic and solid epithelial growths arising in the maxillae. In the complex processes located in the maxillae in connection with the formation of two sets of teeth, abundant opportunity is presented for

abnormal overgrowth of several structures in various stages of development. While nearly all composite odontomas are developmental in origin, there is evidence that trauma and infection may, in rare instances, produce them by interfering with the coordination of normal growth.

DIAGNOSIS OF ODONTOMA

A detailed history and a careful clinical examination are essential. Swelling or deformity indicates an abnormal condition within the jaw bone. However, the patient is not always conscious of slight swelling due to slow tumor growth. Dull or intermittent pain may occur. Slight periodontitis in the neighboring teeth or suppuration may take place in the area of the tumor. Absence or an unusual position of one or more teeth is often noted on dental examination. With gradual increase in size, normal bone may be destroyed to the extent that pathologic, accidental or surgical fracture may take place. Roentgenographic examination is necessary to determine the position and size of the tumor as well as the presence of unerupted teeth. Regular intra-oral dental and occlusal films are of great value. Biopsy is often necessary, and all tissue removed surgically should be sectioned and subjected

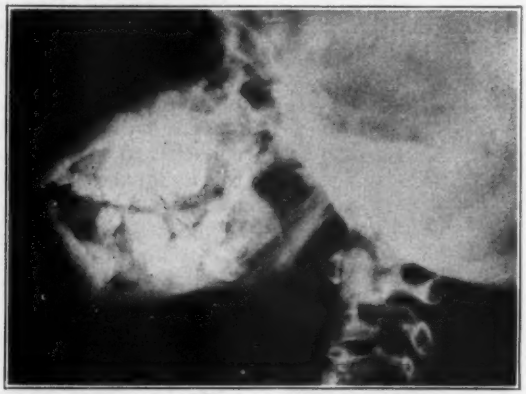

Fig. 4.—Lateral view; showing oval tumor mass in left maxilla.

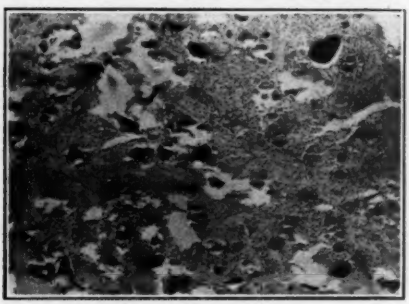

Fig. 5.—Compound composite soft odontoma; showing numerous rounded calcareous bodies in cellular connective tissue matrix. (×105.)

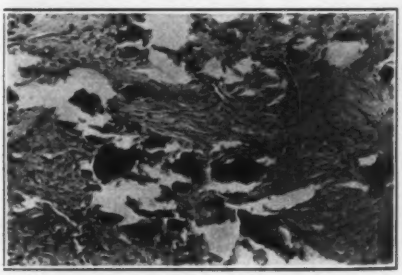

Fig. 6.—Compound composite soft odontoma; showing rounded denticles composed of cementum, dentin and enamel surrounded by cellular connective tissue fibers. (×265.)

to careful histologic examination.

TREATMENT OF ODONTOMA

Complete intra-oral surgical removal is indicated. Unerupted teeth associated with these tumors should be removed. Care must be taken to avoid pathologic facture. The ultimate prognosis is excellent. After removal of the tumor, bone usually regenerates in a surprisingly satisfactory manner. The incision is made along the buccal or alveolar process ridge. A wide exposure is provided by retraction of mucoperiosteal

Fig. 7.—Appearance of patient six months after operation; showing correction of deformity and absence of facial paralysis.

flaps. Excision of the entire calcified tumor mass, which is imperative, requires painstaking removal of adjacent and overlying bone. In our experience, the placing of sulfanilamide powder in the wound has been found to be of value in combating postoperative infection. A loss of alveolar process and exposure of the maxillary sinus and nose may result in a large defect, presenting a postoperative problem of healing and dental restoration.

REPORT OF CASE

History.—G. E., a colored woman, aged 41, admitted to the Laird Memorial Hospital, February 27, 1941, complained of a painful tumor on the left side of the face. About five years previously, she noticed a small mass over the left maxilla, which had continued to enlarge. Two years previously, she commenced having an aching pain in this region. The mass was incised at another hospital and two teeth were extracted. There was no improvement following this procedure and the tumor continued to grow. There had been no impairment of vision or hearing. The past history and family history were both essentially negative.

Physical Examination.—The patient was fairly well developed and nourished and did not appear acutely ill. There was a large mass over the left side of the face extending from the orbit down over the maxilla and into the hard palate. On palpation, the mass was firm, fixed, non-tender and of smooth outline. (Figs. 1 and 2.) The teeth on the left had been displaced downward and the left upper jaw was partially edentulous. The temperature was 98.6° F.; pulse rate, 68; respiratory rate, 20; blood pressure, 110 systolic, 84 diastolic. The eyes, ears and nose were negative. Examination of the chest and abdomen was negative. The extremities were normal. Anteroposterior and lateral roentgenograms of the skull disclosed an oval bony tumor of about the same density as the maxilla, measuring 10 by 7 cm., with a sharply marked outline in the left maxillary region, extending almost into the left orbit and to the outer side of the base of the skull. There was no breaking through or irregularity in outline at any point. (Figs. 2 and 3.) Clinical laboratory examinations were negative.

Diagnosis.—A diagnosis of odontoma of the left maxilla was made and operation advised for complete removal of the neoplasm.

Operation.—This was performed March 5, 1941, by C. H. Engelfried and C. L. Kennedy. The area was prepared with tincture of merthiolate. Pentothal sodium anesthesia was administered by T. Kerr Laird. An incision was made through the mucosa over the tumor and the underlying tissue separated. The tumor was found to be surrounded by a thin shell of bone, which was removed. It

was then enucleated completely by curet and periosteal elevation. It extended through the maxillary antrum to the intra-orbital plate. The left maxilla, with the remaining teeth and a portion of the hard palate, was removed. Sulfanilamide powder was placed in the wound and the redundant mucosa approximated with No. 1 catgut suture.

Outcome.—During the first twenty-four hours of the postoperative course, the temperature was 100, pulse rapid and blood pressure between 50 and 90 systolic. Postoperative treatment consisted of a limited soft diet, administration of morphine sulfate for pain and blood transfusion of 500 cc. of citrated whole blood by the indirect method. The wound did not become infected and healed by granulation.

The case was followed up by the tumor clinic board and, at the end of six months, there was no evidence of neoplastic recurrence. The patient is now in the best of health.

Pathology.—Macroscopic examination revealed 420 gm. of irregular, firm, whitish gray fragments of tissue and thin shelllike particles of bone. The tumor on section showed markedly increased resistance. It was filled with fine calcareous material. Microscopic study of twelve sections from different areas of the tumor disclosed a matrix of cellular connective tissue which contained exceedingly numerous rounded, oval and irregular bodies. With hematoxylin and eosin, a few of the bodies stained a faint pinkish blue, while most of them were reddish purple or deep bluish purple. The periphery took a deep basic stain. In shape and appearance, many of the bodies were suggestive of rudimentary or imperfectly formed teeth. The connective tissue was arranged in a cellular pattern between and about them. The stroma adjacent to the periphery of the tumor was more cellular than at the center. The nuclei of the connective tissue cells were for the most part elongated, some being angular, oval or rounded. No mitotic figures were observed. Careful examination of the numerous sections failed to disclose cystic, solid or cordlike structure of epithelial cells or enameloblasts. The diagnosis was compound composite soft odontoma.

DISCUSSION

Composite odontomas are made up of a group of calcified growths of tooth structure. Aberrations in tooth development result in slow, controlled formation of tooth structure either in single masses or in numerous denticles contained in a cyst. The masses, which vary in size, contain enamel, dentin and cementum in varying proportions. Pulp tissue may be present. Composite odontomas have no typical termination. Cases are on record showing a persistent tendency to recurrence after even quite radical surgical removal. Composite odontomas are found more often in the mandible. The unusual formations of enamel, dentin, cementum and pulp tissue have no orderly arrangement with respect to one another. Calcified odontomas have their origin during the years of tooth development. The tumor here described was classified as a compound composite soft odontoma. It was noteworthy for its large size, slow growth, unusual microscopic picture and successful surgical removal. The specimen is now in the U. S. Army Medical Museum, Accession No. 73089.

CONCLUSIONS

1. The successful treatment of odontoma is complete intraoral surgical removal.

2. Sulfanilamide powder placed in the wound is of value in combating postoperative infection.

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WHY ORTHODONTIA CASES FAIL

By HOWARD E. STRANGE, D.D.S., Chicago, Ill.

IF we thoroughly study the problems associated with the practice of any branch of dentistry, we find that they are very complex. The therapy to be employed depends on the case. It is difficult to discuss the causes of clinical failure because the basis of any orthodontic practice or procedure is almost entirely empiric. The orthodontic problem is complicated by the fact that a mean established by examining the morphologic structure of a large number of persons does not prove to be physiologically valid when applied to the individual.

We often hear that a statistical normal, as it has been called by many investigators and writers, is synonymous with the individual normal, which to a large degree is functional. Conclusions arrived at by the research worker must receive the test of clinical application or comparison if they are to be of any value. Orthodontic problems are complicated by the fact that there is a variation in individuals, and nature does not grow organisms along the lines of precise mathematical symmetry. Each case is an individual problem, and the individual normal is the significant fact.

Franz Boaz[1] indicates that statistics do not produce a standard of normality for the individual. In an article on growth, he states:

> Obviously not all children grow according to the standards obtained by the so-called generalizing method, but some will grow much, others little; some will mature early, others late. Their growth depends on many circumstances: Heredity, environment, health, and nutrition, to name a few determining conditions.

All dentures cannot be brought to one precise ideal type, and Hrdlicka[2] writes:

Read before the Section on Orthodontia at the Seventy-Seventh Midwinter Meeting of the Chicago Dental Society, February 18, 1941.

The intensive desire on the part of the orthodontists to find immutable points on the jaws, face or head, from which to take the measurements they are in need of, is but natural. If such points could be had, it would help greatly. That is why so many cling so tenaciously to Simon or any other authority who advocates some definite landmarks. Regrettably such strivings are futile. There are no fixed points, except in the average obtained on a large series of individuals. Everyone of the landmarks that ever was or could yet be advocated is subject to precisely the same phenomenon of normal variation.

Treatment cannot be standardized by the use of any one certain type of mechanism, and we rarely find a duplication of conditions in similar types of malocclusion.

These introductory remarks are made to indicate the complexity and seriousness of any orthodontic problem. One can practice orthodontia and prevent many failures, if able to apply fundamentals and principles substantiated by the test of clinical application. Dogma or creed has no place in orthodontia, and no single person or group of persons has a corner on all orthodontic knowledge.

William W. Woodbury,[3] in "Orthodontic Suppositions," says:

Students, so far as I know, are not taught primarily the forces that control the shape of the eye or the pelvis or the hand, and yet these structures appear to maintain their form at least as consistently as the dental arches. Forces of one sort or another are doubtless at work within and upon them, but they are not visualized with the simplicity and finality that so many dental writers employ when dealing with the teeth. The effort to simplify what is complex is praiseworthy and helpful so long as the result is not a specious simplification, but one should approach all such attempts with an open mind. Where many of our confrères have not hesitated to rush in with a ready solution or a confident explanation, those who are best qualified tread warily.

In his article, Woodbury quotes D'Arcy Thompson, who describes his classic treatise on growth and development as merely a preface to the subject. Thompson says, toward the end of the book, "For my part I readily confess that I lack the requisite knowledge for even an elementary discussion of the face of a fish or of a bird."

Fulfilment of all undergraduate educational requirements and the attainment of a dental degree indicate that the graduate in dentistry is qualified to be examined by a state board of dental examiners. In turn, if the graduate is successful in this examination, the board gives him a certificate indicating that he is qualified to practice dentistry within the confines of the state. Commencement and certification of fitness are only an indication that one is qualified to commence the practice of dentistry. In order to maintain a high standard of efficiency and progress and keep in step with scientific advancement, it will be necessary for each practitioner to study and to attend various lecture courses, meetings, etc. Such a procedure is a source of refreshment and energy, a perpetual conditioning process that should help eliminate the possibility of failure in practice. This axiom applies to the science of orthodontia or any other branch of dentistry. The percentage of failure in any division of dentistry may be decreased, and there will be a minimum of costly trials and errors if the operator has mastered the important and numerous fundamentals, and possesses the ability to apply facts and laws in treatment.

A little knowledge *is* a dangerous thing, and many failures can be prevented if one accumulates a vast knowledge of facts and basic principles. Self-education and continued refreshment by study enable one to apply sound reasoning in treatment and maintain a standard of efficiency in practice.

I should like to recommend to any one interested in orthodontic problems William W. Woodbury's[3] article on "Orthodontic Suppositions." He writes:

What often happens is that the orthodontist does not realize that his procedure is empirical. Some one thinks out or stumbles upon a procedure, an appliance, a classification, or what not, that yields a satisfactory outcome in a few cases. At this stage he too often dreams of universality of application. He may even think that he has solved the orthodontic problem so he begins to rationalize his procedure, seeking a scientific and philosophic foundation for his course of action. Unfortunately the chances are that he has not had the fundamental training that is essential where evidence is to be weighed objectively. His enthusiasm is apt to run away with his judgement: he becomes an advocate of his idea instead of an impartial investigator of its truth, and so his conclusions are of little worth. His followers are not likely to be more critical than he is, but accept his conclusions at their face value. The foregoing has been pointed out many times in recent years, and there are beginning to be signs of encouragement. More men are taking a realistic view of our field and its problems, and are being swayed less by wishful thinking. Nevertheless the present state of our literature and the prevailing atmosphere of our gatherings make it imperative that we continue to remind ourselves frequently that the bulk of our treatment is empirical. With this realization clearly before us there is hope for advance.

The past decade has seen a gradual improvement in orthodontic education. A great amount of useful knowledge has come out of the research and clinical laboratory. I believe that the next decade will see steady and substantial advancement and a coordination of thought regarding growth, development, function and treatment. It will be a decade that will see the gradual elimination of old animosities, the promotion of a general healthy understanding of the various problems in orthodontia. An impersonal objective approach to all problems coupled with sound reasoning based upon fundamental facts paves the road to successful accomplishment, and the failures that cloud the horizon will be at a minimum.

Orthodontia is more than a problem of tooth alinement and effecting a straight appearance of the teeth. Each case is a law unto itself, and the operator is courting failure if he commences treatment before adequate study is given to the case. Time will not permit a consideration of all the causes of orthodontic failures, but I shall attempt to present the most important items:

1. Cases are a failure because the operator does not have sufficient fundamental knowledge of the normal. He does not realize that the teeth are placed and held under a group of conditions, some static and some dynamic, and only so long as these forces stay in equilibrium and balance will the teeth stay in normal occlusion. A knowledge of the normal is not limited to occlusion of the teeth.

2. The process of classifying a case of malocclusion is case analysis. Successful treatment depends on the operator's knowledge of fundamentals and an application of these facts and laws in case analysis. Strang[4] states:

> The proper classification of a case of malocclusion is such an important factor in relationship to subsequent treatment that it should never be passed over lightly or decided upon after a hasty glance at the plaster casts. There are several facts of influential significance to consider in order that the final conclusions may be correctly reached, and these are tabulated in their logical sequence as follows:
>
> A. The inclined plane relationship of the teeth with special reference to that of the first molar and canine teeth of each arch.
>
> B. The axial inclination of the teeth, especially that of the upper and lower canines.
>
> C. A study of the facial photographs of the patient as an aid in determining the degree of growth of the lower jaw and its relationship to the anatomy of the skull.
>
> D. The careful noting of missing teeth, either acquired or congenital, and the presence of supernumerary teeth, confirmed and disclosed by a conscientious study of radiograms.
>
> E. The rotation of molars causing them to

acquire more mesiodistal space than is their normal apportionment.

F. The relationship of the central proximal space in each tooth arch with its opposing space in the opposite arch and with the median line of the facial anatomy.

A case of malocclusion requires much study. If we neglect this important item, we shall accomplish little in treatment, and failure will be the result.

3. The operator should not be too eager to place an appliance on the patient's teeth. One is courting failure if one neglects to obtain an adequate case history and other records before making a differential diagnosis. Following are a few of the essential items for orthodontic diagnosis:

A. Personal consultation with the parents and examination of the patient.

B. An itemized history. The orthodontist should endeavor to obtain all essential information.

C. Photographs and roentgenograms.

D. Consultation with the family pediatrician or physician if any physical or constitutional disorders are in evidence.

C. Orthodontic casts of the teeth.

4. We are doomed to failure in the treatment of a case if we do not assume the entire responsibility. It is our problem, and it is not advisable to delegate the responsibility of solution to some one else. It is difficult to understand why any person who has completed a long course of professional training in a recognized dental college should seek the advice of some untrained person when called upon to design a partial denture, a cast gold case, an orthodontic appliance or any other type of appliance. If any laboratory service is to be rendered, it should be given directly under our supervision and direction. Failure will be the result if the laboratory man is our chief diagnostician. The case should be under the direct personal supervision of the operator. A mail order shotgun diagnosis will not solve the problem at hand. It is not my intention to imply that the general practitioner should not give any orthodontic service, but rather to point out that if he does so, he should be prepared to render the service that he represents himself as able to perform.

5. The type of treatment depends on the nature and severity of the malocclusion. We shall fail in treatment if we do not utilize effective corrective procedures.

6. The chances of failure are great if retention is not maintained after termination of active treatment.

7. We are courting failure if we fail to obtain the complete cooperation of the patient in following out the various instructions given during the course of treatment.

8. The chances of failure are decreased if we make an adequate explanation to the parents, informing them of the progress in treatment and our intentions. If they understand, cooperation will probably be forthcoming.

9. If we fail to recognize and eliminate conditions that will interfere with the successful termination or completion of treatment, such as the lack of a balanced diet, with a sufficiency of vitamin D; the presence of systemic conditions that demand consultation with a physician, and physical habits, such as posture or sucking habits, we may expect a partial relapse to the former condition, or complete failure.

10. At the time of the examination and consultation with the parents, we should mention all possible causative factors, such as habits, in the case. The explanation should be followed by a letter verifying our statements. If we neglect to indicate such causative factors, the parents will think that we have failed and that, when their child's teeth show a tendency toward a relapse owing to failure to correct certain habits, etc., we are looking for an alibi.

11. Our plan of treatment should be written out and followed step by step. A systematic plan of management makes

the treatment easier for the patient and begets confidence and cooperation. We shall fail to obtain a satisfactory result if we do not follow a definite and systematic plan of treatment.

12. Within certain sensible limits, nothing is too expensive that benefits the patient. Mechanical theories and technic are not by any means the whole problem in orthodontia, and we are not merchandising appliances.

13. We are bound to fail if we talk in terms of biology and practice in terms of mechanics. Mechanical philosophy is governed by knowledge of biologic principles. An application of principles substantiated by a biomechanical philosophy helps to eliminate failure in treatment.

14. There are no short cuts in treatment, and we must remember that to every action, there is always a reaction. Anchorage must be planned with intelligence, and must be sufficient to eliminate or distribute the effect of the reactive forces. For example, a lack of adequate anchorage in the mandibular teeth in Class 2 cases allows the teeth to drift too far forward in relation to the bony base, the lower jaw. Lack of adequate anchorage in the mandibular arch is evidenced by a collapse in the lower incisal region.

We all have a esponsibility of great magnitude in rendering service to any patient. Our first responsibility is to give conscientious and efficient service. Our second is to assure a satisfactory result. Our third is to the parents. Our fourth is to the dentist or person who referred the case to us. A failure reflects on the person who referred the case. There is no better prosecuting attorney than a guilty conscience, and if we are found wanting in our services, we shall retire at night with a guilty conscience.

Seldom are we entirely successful in producing the ideal norm. However, the normal, or the ideal, is a beacon that guides us in our efforts to continue working toward that goal, the ideal.

In conclusion I should like to quote the final paragraph from J. A. Burrill's[5] article on orthodontic failures:

> In summing up, then, we find that orthodontics is not merely the science of moving teeth here and there in the hope of emulating Angle's secretum apertum, but requires of the orthodontist a comprehensive knowledge of the science of growth and development and a working concept of the biochemical processes of metabolism, so that he may recognize not only the malocclusions but also the adverse influences that enter into the production of malocclusion. Some of us possibly at times fail to do the best that can be done for our patients through lack of knowledge, experience, judgment, and a proper sense of the mechanics of the appliances we have to work with. The mechanics of our appliances is not an exact engineering problem because the foundation for our building cannot be definitely measured. We are manipulating living tissues that react, not according to the laws of physics alone, but to the laws of physiology, biology, chemistry and inheritance as well.
>
> I have not tried to condone failures by this recital of numerous reasons why we fail, and many of us do fail to reach our ideals; but, after many years in the practice of orthodontics, I have concluded in my own mind that it is just as much a folly to try to attain the ideal in some cases as it would be to have no ideal.

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2373 East Seventy-First Street.

FULL MOUTH RECONSTRUCTION INCREASING VERTICAL DIMENSION

By Paul A. Edmand, D.D.S., Chicago, Ill.

FULL mouth reconstruction should not be confused with the subject of full dentures, although they are closely related in that similar basic principles must be closely adhered to in the treatment of the two. Here, we have under consideration the patient with teeth that need to be preserved and made useful through the application of these basic principles. The greatest number of these cases occur among adults, and it shall be my aim to outline certain procedures for treating these cases which will minimize discomfort and help preserve the teeth and their supporting structures. Trauma is, next to caries, the greatest enemy with which we have to deal. However, through carefully applied mechanics, it is possible to eliminate existing trauma as well as to prevent it. Since, along with most of my colleagues, I am busily engaged in earning a living and have little or no time for research, other than that which I am able to do over a period of time in my daily work, my contribution will be based on actual observations of work executed on the living; in other words, on clinical observations.

There are four factors in restorative work which must be carefully considered if we wish to correct or prevent trauma, especially if it is desirable to increase the vertical dimension: occlusion, articulation, balanced occlusion and adaptation.

Read before the Partial, Crown, Bridge and Full Mouth Reconstruction Section at the Seventy-Seventh Annual Midwinter Meeting of the Chicago Dental Society February 20, 1941.

For the moment, let us consider trauma: what it is, when it occurs and what governs the degree of force.

Trauma, which is repeated abnormal occlusal stress, may or may not injure the supporting structures of the teeth, when full complements exist, when some are missing or when irregularities occur. The degree of trauma will depend on the muscles governing the movements of the mandible.

A review of the findings of histologists, pathologists, physiologists, anatomists and biochemists of necessity refreshes the mind and should stimulate us to heed natural laws in doing restorative work.

In order that we may comprehend the results of occlusal stress, let us study the alveolar arch, first of all distinguishing between "alveolar bone," in the strict sense, and "supporting bone," as Orban makes the distinction. Alveolar bone proper consists of the outer and inner plate of the alveolus (outer surface of alveolus and wall of socket). "The space between these two plates is occupied by the supporting bone, which consists of a network of trabeculae connecting the plates of alveolar bone."

Churchill describes the teeth as being slightly movable in their sockets and states that their movement would be pernicious to the investing structure if the form of mastication were allowed to affect each tooth separately. Nature placed the teeth in contact with one another, the dental arch being a continuous row of teeth supporting one another. When the contact point wears, the teeth try to reestablish their relation by

moving anteriorly toward the median line.

My observation has been that contact points and cusps wear down in about equal proportion. Where a full complement of teeth exists, I have observed that the contact points include nearly all of the convex area of the mesial and distal surfaces of the teeth, and the cusps of these teeth are abraded to the point where no cusps exist at all, and, to all appearances, the amount of cusp wear and contact wear has been equal. If muscle control governs the centric and eccentric movements of the mandible, this wearing away of the contact point, and subsequent movement of the teeth anteriorly, will of necessity cause the

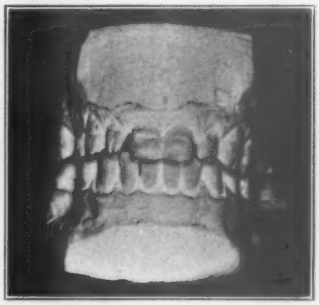

Fig. 1.—Model of typical case in need of full-mouth construction, showing occlusal wear.

cusp relationship of the teeth to change, resulting in a wearing away of the cusps. This, then, is a physiologic phenomenon of nature, and whether the trauma produced in this transition can be withstood by the supporting structures will depend on the structural reinforcement. Should this be less than the break down, in other words the increased rate of supporting structure destruction be greater than the physiologic replacement of bone growth, the teeth must be lost.

The problems of bone growth have aroused great interest and should be of particular concern to us in restorative dentistry. Time does not permit a résumé of the findings of such men as Jones, Roberts and McKee regarding bone growth. However, much of what they say accounts for our success and our failures.

In his treatise on mineralization and demineralization of bone, Gardner has vividly set forth some facts that are in agreement with my observations in several cases, in which the teeth in one arch have had no occlusion over a period of time and hence no work to do. When made to function through restorative measures, the same teeth, loose from disuse, became firm and useful. I have also observed that loose teeth traumatized by defects in occlusion likewise recovered stability when restored to

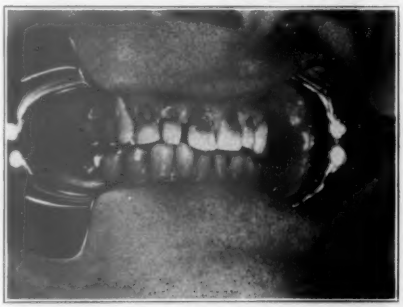

Fig. 2.—Anterior view of case in Figure 1.

balance. These results were evidently due to the fact that we were able to obtain the right kind of tooth exercise through restorative procedures. The exercise used here caused the right amount of stimulation, provided for a lessened blood supply and, with a sufficient intake of minerals, assured a favorable result. Gardner explains that we must interpret demineralization as evidence of an increase in blood supply, and mineralization as evidence of a decrease in the blood supply. This may seem confusing when we are taught that by exercise more blood is brought to a part; but such confusion is cleared up when we realize that the blood stream

is the carrier of mineral salts, and only by exercise will the deposition of salts take place and, as the bone becomes well mineralized, the blood supply diminishes. Orthopedic surgeons have observed that when the exercise of the arm and hand has been diminished by splinting, the mineral salts move out of the bones in such an amount that, with the resulting increase in blood supply, the process can

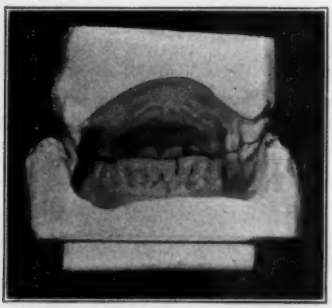

Fig. 3.—Lingual view of model in Figure 1.

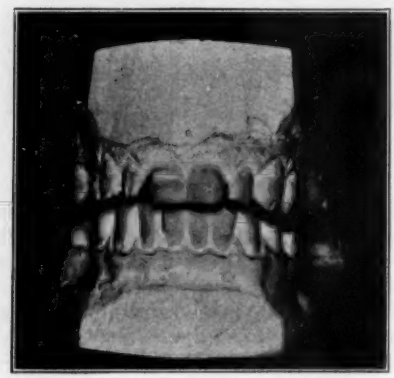

Fig. 4.—Upper and lower casts in centric relation with wax bite in position.

be seen by roentgen rays. When the splint is removed and the arm and hand resume work, the mineral salts return. This, then, is a physiologic action wherein mineral salts, when not needed in one part of the body, are taken from the bones in that part to another part of the body.

I would not have you think that all supporting structural disturbances can be corrected through restorative measures because in some cases, at an early age, the tissues show advanced disturbances, with congested gingivae and marked disintegration of the supporting structures.

Now, let us briefly define the four factors previously mentioned which must be considered in prevention and correction of trauma: occlusion, articulation, balanced occlusion and adaptation.

1. Occlusion is the occlusal contact of the teeth, lower teeth against upper, in

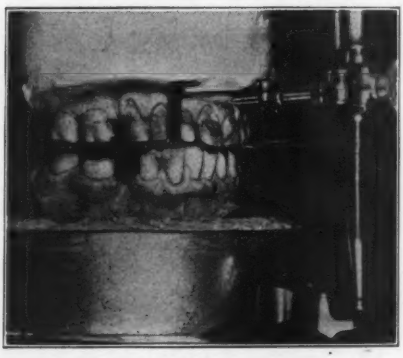

Fig. 5.—Models of case mounted on articulator with guide-meter in position, showing casts mounted with opening axis on occlusal plane.

the various positional relations of the mandible.

2. Articulation is the sliding contact of the teeth from one positional relation of the mandible to another positional relation.

3. Balanced occlusion is the occlusion presenting the greatest possible number of occlusal contacts in any positional relation of the mandible reciprocal with all other relations without interference during articulation.

4. Adaptation is the seating of a partial denture or fixed bridge on the alveo-

lar arch so that its presence will enhance physiologic stimulation.

In order to balance occlusion, it is necessary to occlude the teeth in the positional relations of the mandible and to articulate them to the movements of the mandible.

Positional relations of the mandible are the result of movements of the mandible. It follows, therefore, that understanding of the movements of the mandible is necessary before the selection and application of these movements and the positional relations can be made.

The mandible moves in three dimensions, having, therefore, three component movements: (1) opening and closing, (2) anteroposterior and (3) lateral.

Movements of the mandible are controlled by the temporomandibular articulation (condyle paths) and the occlusion of the teeth. The temporomandibular articulation takes precedence over the teeth, because it precedes existence of the teeth, i.e., their eruption, and continues after their loss. Therefore, for the occlusion to be balanced, it must be synchronized with the condyle paths characteristic of each patient, whereupon the two become harmonious and inseparable, being equal.

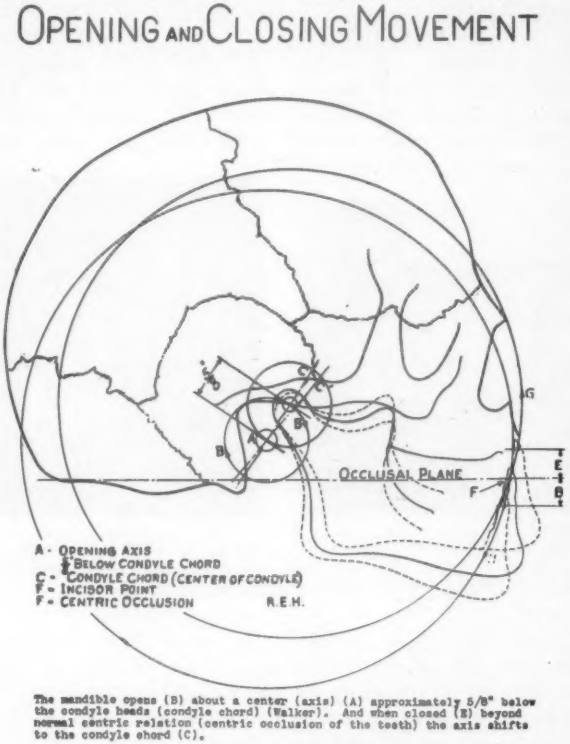
OPENING AND CLOSING MOVEMENT
OCCLUSAL PLANE
A - OPENING AXIS
B - BELOW CONDYLE CHORD
C - CONDYLE CHORD (CENTER OF CONDYLE)
F - INCISOR POINT
F - CENTRIC OCCLUSION
R.E.H.
The mandible opens (B) about a center (axis) (A) approximately 5/8" below the condyle heads (condyle chord) (Walker). And when closed (E) beyond normal centric relation (centric occlusion of the teeth) the axis shifts to the condyle chord (C).

Fig. 6.—Opening axis on occlusal plane. (After Hall.)

Nature presents two forms of occlusion, cusp tooth and cuspless tooth; the former at the beginning of life; the latter, because of wear of the teeth, in old age.

The replacement or restoration of teeth is made both with cusp teeth and with cuspless teeth, through either necessity or choice.

Cusp tooth occlusion requires that the mandible open in order that the occlusion may function; whereas cuspless tooth occlusion does not.

Cuspless tooth occlusion is classified as two-dimensional occlusion, and movement of the mandible associated with it is classified as two-dimensional movement, because it embodies the anteroposterior and the lateral component movements of the mandible (two only of the component movements).

Cusp tooth occlusion is classified as three-dimensional occlusion, and movement of the mandible associated with it is classified as three-dimensional because it embodies the anteroposterior, lateral and opening component movements of the mandible (all three of the component movements).

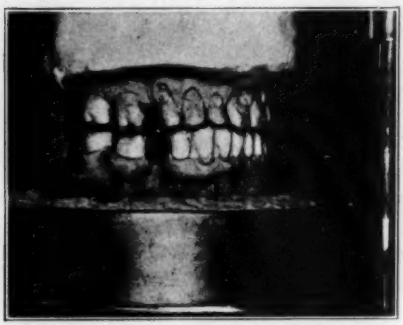

Fig. 7.—Three millimeter opening.

Consider a case wherein the supporting structures show definite destruction as well as the necessity of increasing the vertical dimension. Roentgenograms of the temporomandibular articulation are always valuable in repositioning the mandible. It may not always be possible to obtain a roentgenogram that will be accurate, but an attempt should be made to obtain some idea as to the existing position of the condyle head before repositioning the mandible. I have noted that an increase of 2 or 3 mm. in vertical dimension could scarcely be noticed in a roentgenogram; but, when the increase was beyond 4 mm., a definite change in the position of the condyle head could be seen. It is when an attempt is made to increase the vertical dimension considerably that I suggest a roentgenogram of the temporomandibular articulation as a guide in preventing an abnormal or uncomfortable positioning of the condyle head.

By building such a case in two dimensions, we obtain an equalized vertical stress, from which we need have no fear of trauma, and with a minimized amount of lateral stress. Kronfeld pointed out, in his recent book, that the greater possibility of damage from lateral than from vertical stress has been recognized for a long time from clinical observation; the practice of eliminating high cusps and lateral interlocking cusps in old patients should be discouraged, and the dentist should do what Nature has often failed to do in modern man; namely, provide adequate occlusal wear.

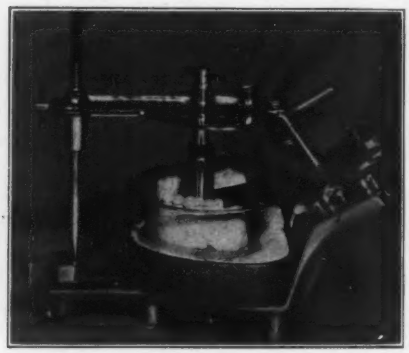

Fig. 8.—Case with lower cast and surveyor in position, to determine comparable radius for occlusal construction.

With the teeth in occlusion and the articulator closed, the length of the cusps and incisal edges of the upper teeth are marked on the lower cast. This can be done with a sharp pencil. The upper case is removed from the articulator and, in its place, what I call a template surveyor is adapted. These surveyors are

interchangeable, having radii of 3, 4, 5 or 6 inches. They are different from an ordinary template in that they can be raised or lowered, or held securely in position, or can be swung laterally or backward or forward. They are so constructed that the cusps and incisal edges of the lower cast may protrude through and not interfere in the survey. The raising or lowering of this type of surveyor permits a close study of the cusp and incisal lengths, and allows for the selection of a radius upon which to build comparable to that of the case at hand.

After mounting and surveying the models as stated, we obtain the functional centric relation of the mandible to the maxillae, a requisite for further survey and for balancing two-dimensional occlusion. Various methods for obtaining this centric relation are available. Some may prefer to make a gothic arch tracing, and thereby locate so-called functional centric relation, but I have found that equally good results can be obtained by having the patient exercise the mandible up and down, at the same time biting into wax which is thick enough and tough enough to withstand the force exerted by the patient, until a satisfactory distance is attained in the wax, at which point we wish to open the bite. The wax used in taking this bite is placed across the occlusal surfaces of the teeth posteriorly from the cuspids. This allows the operator to study what the patient is doing and also to visualize the amount of opening which is being created, since the anterior teeth will be exposed for observation.

Should the occasion arise, through necessity or choice, that construction of a case in three dimensions would be advisable (usually this occurs where only the upper or lower arch is to be rebuilt and there are cusps involved), it will be necessary to register the movements of the mandible within the range of occlusion of the teeth and to position the mandible when taking checkbites so that the positions used will be those assumed by the teeth.*

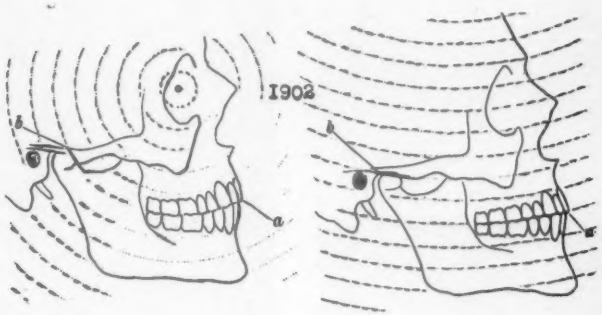

Fig. 9.—Influence of condyle path in protrusive movement on curve of Spee. (Spee.) The curve of Spee and condyle path must harmonize. Left: Condyle path with inclination of about 45° to occlusal plane. Right: Condyle path with almost no downward inclination. (Christiansen.)

For registration of three-dimensional positional relations of the mandible within the range of occlusion of the teeth,

*The author's equipment necessary to obtain relations of the mandible within the range of occlusion of the teeth in constructing a case in three dimensions is illustrated in THE JOURNAL, Vol. 25, p. 854, June 1938.

two metal plates are fitted to the lingual surfaces of the teeth just above their greatest diameter. Embrasure supports may be added in some cases to increase the stability of these plates. When properly constructed, they remain firmly in position. In the upper plate, a hole is drilled and threaded to fit a screw, the end of which is turned to a sharp point

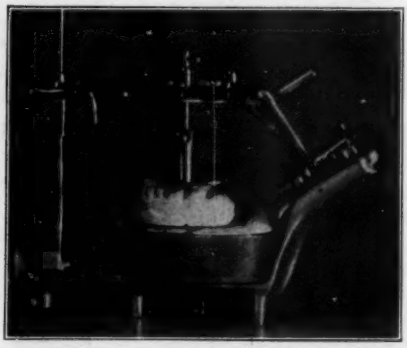

Fig. 10.—Template having 6-inch radius positioned as determined by surveyor.

Fig. 11.—Waxing of guide supports, using template as occlusal guide.

and case hardened. The lower plate supports an interchangeable disk. These disks are made interchangeable because it may be necessary to make more than one series of registrations.

With the plates in the mouth, the screw in the upper plate is set to the desired vertical dimension. The patient is then asked to move the jaw from out in, as in function and under pressure, simulating the act of masticating food, first on one side and then on the other. The tracing will show a modified gothic arch, and the apex, instead of being sharp, will be rounded. At this point, the patient is asked to protrude and then to retrude the mandible as far as possible. This tracing will bisect the first tracing. It will be noted that the distal termination of the tracing would form the apex

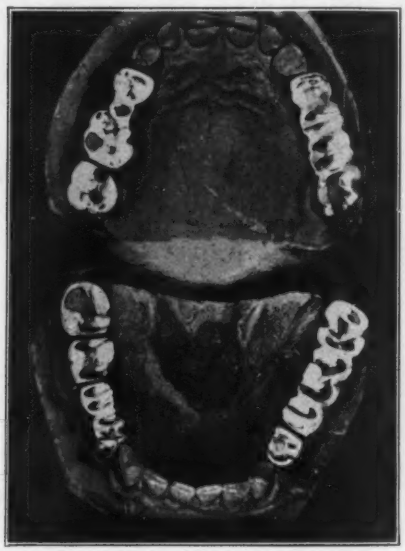

Fig. 12.—Guide supports in position; occlusal view. The patient has worn the supports into an occlusal harmony with the condyle path.

of the customary gothic arch if the legs of the gothic arch were extended. No attention, however, is paid to the point that would be the apex of the customary gothic arch because this is a strained and uncomfortable position. At the intersection of the two tracings, a dent is made with a sharp-pointed instrument. The point of intersection is the centric relation of the mandible.

The dent is used as the center to drill a small hole through the registration plate, which positions the point of the screw, establishing centric relation.

In order to determine the measurement of the overjet, the patient is instructed to protrude the mandible until the anterior teeth are in end-to-end or flush relation, in which position the mandible is moved from side to side, scribing a line that intersects the protrusive line, where the hole for the protrusive registration is drilled.

The disk containing the first tracing is removed and another inserted. Before any new tracing is made, the screw is turned one and one-half turns, the vertical dimension thereby increasing three sixty-fourths inch; i.e., one thirty-second inch to each turn of the screw.

The length of the screw is increased three sixty-fourths inch to allow for opening of the mandible to clear the cusps of the teeth, which is equal to the depth of the cusp, and is the approximate average cusp depth. If there were no cusps on the teeth, it would not be necessary to make a second tracing, because we would have no opening of the mandible to reckon with. With the second disk in position, the patient is requested to make the same movement as before, locating centric position in this vertical dimension. A dent is made in the

Fig. 13.—Teeth in lower arch rebuilt in two dimensions with fixed movable bridgework, to conform to guide supports in upper arch.

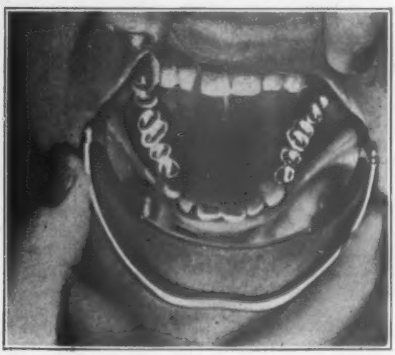

Fig. 14.—Upper arch rebuilt in two dimensions to conform to restoration of lower arch.

Fig. 15.—Completed case.

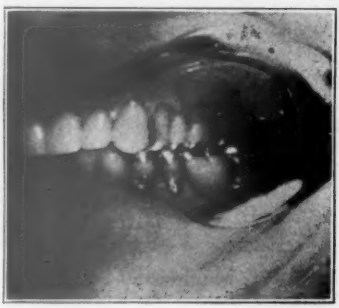

Fig. 16.—Completed case. The porcelain jacket construction of the upper anterior teeth was accomplished by selecting suitable facings. These were ground to an approximate adaptation of the dies, waxed on the mesial, distal, lingual and gingival aspects to tooth form, and invested, facings and all. The wax was eliminated and porcelain vibrated into the mold and baked.

disk, but no hole is drilled. With a pair of dividers set at three sixty-fourths inch, this distance is marked off on each leg of the gothic arch from the dent, and holes are drilled as the one was drilled in the first disk to indicate a centric position.

It is seen that this procedure trusts nothing to an articulator for accuracy in producing checkbites of positional relations of the mandible. Furthermore, it is observed that the correct mandibular movement is employed in making checkbites according to the form of occlusion being established. Using two registration disks and making registrations in two different planes effect the arcuate movement when an occlusion established according to them is put into function in the mouth. The records made in these respective planes are not functional. Functional movements occur between these two planes.

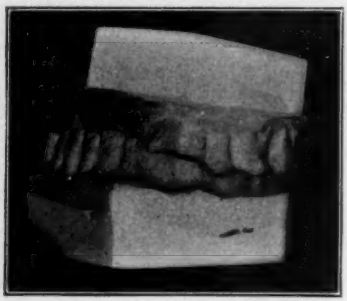

Fig. 17.—Model of unusual case.

Having completed the registrations, we are now ready to take checkbites of either one or four positional relations of the mandible to the maxilla, transferring them to models of the case for mounting on the articulator.

In mounting a case on the articulator for two dimensional occlusion, the centric relation of the mandible to the maxillae registered in the wax bite is established on the casts, which are mounted on the articulator with the opening axis on the occlusal plane.

The mounting of a case for three-dimensional occlusion on the articulator is as follows: With the disk in place and the screw set at centric height and resting in the centric hole, a checkbite is secured with stiff plaster of Paris or modeling compound pressed between the two plates. This checkbite is transferred to the cast and articulator and a metal record poured, etc., until the desired positional relations have been secured and records made. The centric positional relations having been obtained, the survey completed and a decision made as to

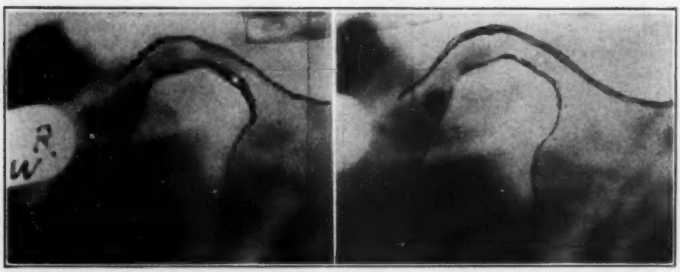

Fig. 18.—Temporomandibular areas. The condyle head moved backward and upward when the vertical dimension was increased 5 mm. Roentgenographic appearance before (right) and after (left) increase in vertical dimension. The rounded light area marked R W is the ear-rod on the Higley head positioner. The ear-rod is always in the same calibrated position. Position in change of the condyle head backward can be determined by measuring the distance between the ear-rod and the beginning anterior tilt of the ramus. The upward change can be determined by measuring the distance between the downward inclination of the condyle head and the anterior descending curve of the glenoid fossae.

radius and type of occlusion to be established, the making of "guide supports" is next in order. I prefer the term "guide supports" rather than the one usually used, namely, "splints," because guide supports are exactly what they imply; in other words, they support and guide in our construction, while the term "splint" calls to mind a form of crutch which sometimes has been used more or less in a permanent construction. I am not in favor of cementing so-called splints permanently on the teeth as a means of correcting trauma, because the very physiologic movement of the teeth then becomes restricted. This is exactly what we wish to avoid. Likewise, the so-called removable splints, which open the bite and presumably aid in establishing the occlusion, help to increase the destruction of the supporting structures rather than correct or aid in obtaining physiologic stimulation of the structures.

If two-dimensional occlusion has been decided on, we begin waxing up the lower arch in centric relation with the guide-pin set for this type of occlusion. The upper model is removed from the articulator, and, in its place, a template having the desired radius is attached, being positioned to the height indicated by the surveyor or the height determined on in building the lower wax guide supports.

After casting, the metal guide supports are returned to the articulator and discrepancies in casting are checked and corrected with the template still in position. This completed, the template is removed and the upper model replaced on the articulator. The upper is waxed with the lower guide supports for the occlusal radius. Again, after casting, the upper metal guide supports are returned to the models on the articulator and the discrepancies checked, these being minimized by spot grinding when necessary.

With the guide supports in the mouth, the patient is required to "grind them in," using a rapid cutting abrasive paste

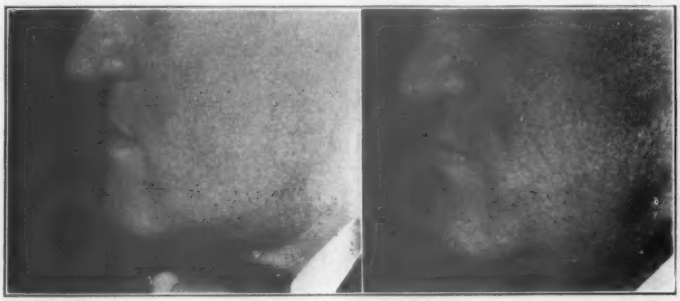

Fig. 19.—Profile before (right) and after (left) opening; showing collapse of facial features before increase in vertical dimension.

Fig. 20.—Restoration of upper lip line, before (right) and after (left).

to better harmonize the guide supports with the condyle path. Later, the patient is given two pieces of chewing gum in which is incorporated abrasive carborundum paste, being asked to chew this for a period of thirty minutes, at two or three sittings. This is done for the purpose of helping to establish the passive and functional relations of the mandible. Hall classifies positional relations of the mandible as passive and functional; passive when there is no food between the teeth and the muscles are not under tension, and functional when there is food between the teeth and the muscles are under tension. He points out, further, that no articulator of whatever description can ever record and reproduce

Fig. 21.—Removable guide supports in position built in two dimensions. The case is ready for permanent restoration.

all functional relations of the mandible, because these are variable according to the position of the bolus of food between the teeth and the muscular force exerted. In one case, for example, intrusion of the condyle results when the bolus is forward of the point of muscular balance, and extrusion of the condyle when the food is back of the point of muscular balance. This causes torsional displacement of the mandible, which it is not possible to register with checkbites or to reproduce in an articulator.

Occlusion can be balanced to these relations only by spot grinding functional markings when they develop with the use of the teeth.

Having satisfied ourselves that the guide supports are adapted and assume comparable relationships for the case, the next step is the construction of permanent work. Segments of the guide supports are removed from time to time, as the teeth are prepared for inlays, crowns or fixed or removable bridgework, the occlusal surfaces of each being adapted to the guide supports throughout until completion of the case. The result will be a reconstructed set of teeth capable of assuring physiologic function when in use. All removable bridgework and partial dentures receive final adaptation after completion. This is done by means of rebasing all saddles, using as

Fig. 22.—Side view of case in Figure 21.

a medium 50 per cent beeswax and 50 per cent paraffin, applying this in liquid form to the saddles, warming sufficiently in warm water, placing in the mouth and having the patient close the teeth. The case is removed, trimmed, again placed in warm water and returned to the mouth. The patient again closes, and, in this position, the rebase material is chilled. The case is removed from the mouth and a permanent rebase is made from natural base rubber or from one of the acrylic resins. In obtaining this adaptation of the saddle to the alveolar ridge in this manner, we get an adaptation made under biting stress, and hence the removable bridge or partial denture

will exert a more physiologic stimulation than if adaptation were obtained under pressure other than what the patient produced. In other words, we will not have overcompression of tissue, which is detrimental to physiologic stimulation.

In closing, I should like to call attention to the fact that dentistry offers some ameliorative measures for patients suffering from neuralgia and ear symptoms by repositioning of the mandible and full mouth reconstruction. Cooperation of the otolaryngologist with the dentist can, in many instances, help the suffering.

Lastly, we can improve the wry physiognomy of a patient whose chin almost touches the tip of his nose, with little need to jeopardize the teeth provided due consideration has been given to (1) occlusion, (2) articulation, (3) balanced occlusion and (4) adaptation.

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55 East Washington Street.

ORAL HERPES (SIMPLEX) MANIFESTATIONS; TREATMENT WITH VITAMIN B COMPLEX

By LESTER W. BURKET, D.D.S., M.D., Philadelphia, Pa., and
GEORGE C. HICKMAN, D.D.S., Westfield, N. J.

IN the past, herpes labialis, canker sores or solitary aphthae, recurrent aphthae and aphthous stomatitis were believed to be of different etiology. There is evidence now that all these conditions represent manifestations of the herpes simplex virus.[1] Mikulicz's aphthae, or peridentitis mucosa necrotic recurrens, is probably of a different and yet unknown etiology.

Herpetic lesions of the lips, buccal mucosa or tongue are frequently encountered by the dentist. The occasional solitary lesions are not only annoying, but also disfiguring. The recurrent or chronic forms of the disease constitute a therapeutic problem. The dental practitioner had no generally effective therapy for preventing recurring lesions on the lips or oral mucosa or of limiting the duration or extent of the lesions.

We have treated the various oral herpetic simplex manifestations with vitamin B complex or certain of its fractions. The solitary herpetic lesions, recurrent herpes (aphthae) of the oral mucosa and herpetic stomatitis associated with herpes genitalis are included in this report. Cases of acute aphthous stomatitis in infants were not available for study.

ETIOLOGY

A discussion of the etiology of herpetic lesions must consider both primary and secondary exciting factors. While use of

From the Department of Oral Diagnosis, University of Pennsylvania Dental School.

the rubber dam, an acute upper respiratory infection or exposure to bright sunlight may bring on an attack of herpes in sensitive individuals, it is generally believed that the exciting cause is a virus.[2] This virus has little pathogenicity for man except for production of the lesion.[3,4] Typical herpetic lesions have been produced experimentally in both human beings and animals by inoculations with the vesicular fluid. The virus has been recovered from the fluid of the experimentally produced vesicles.[5]

It has been shown that, irrespective of age, if an antibody is present at all, it is usually present in high titer.[6] Hudson[7] found a high antibody titer in 85 per cent of adults studied. When herpetic stomatitis was observed in one or several members of a family, those presenting the clinical manifestations of the disease all had a low antibody titer. It is assumed that a similar low antibody titer exists in persons susceptible to recurrent herpetic lesions. The serum antibody against herpes simplex virus shows striking differences in different social groups.[8] Antibody was demonstrated in from 90 to 95 per cent of public hospital patients and in only 40 per cent of university graduates.

Others believe that the development of the herpetic lesion is related to an allergy[9,10] or focal infection.[11] Persons with an exudative diathesis are prone to develop herpetic lesions. Case reports associating herpetic lesions with an allergy to certain foods are numerous. The ingestion of certain foods will precipitate the development of aphthae, but this is not proof of a direct etiologic relation between food allergy and herpetic manifestations. There is little evidence in support of the allergic theory of etiology, it being based mostly on case histories wherein aphthae are reported as following the eating of walnuts, chocolate, oatmeal or some other food.

There is evidence that a single virus is the etiologic agent responsible for herpes simplex, "cold sores," herpetic stomatitis and the solitary and recurrent aphthae, as well as herpes genitalis. The clinical manifestations of the infection may depend on, and be modified by, a number of predisposing conditions which will be discussed later.

INCIDENCE

Infection with the herpes virus is almost universal. The initial infection may be evidenced by herpetic stomatitis in infancy, or it may go unrecognized as a mild respiratory infection. It is often accompanied by fever and not uncommonly associated with secondary bacterial infection, especially in children.[12] Epidemic forms of herpetic stomatitis and pharyngitis have been reported.[13] In all probability, once the infection has occurred, the virus remains present in the body throughout life. The general adult population acquires a high grade of immunity, but those with less highly developed immunity, or those whose immunity or resistance is lowered by other causes, may present occasional or recurrent herpetic lesions.

Of dental interest is the possibility of transmitting the infection by droplets of saliva.[14] The virus can be readily transmitted in the saliva as well as other body secretions during the clinical course of the disease. In recurrent lesions, it is virtually absent from the oral secretions during quiescent periods. Salivary contamination, as a means of spread, is particularly important in the age period 1 to 3.[6]

Numerous predisposing conditions may serve to precipitate the clinical lesions. Herpes is commonly associated with pneumococcal pneumonia, meningitis and the common cold. As far as herpetic lesions of the lips or oral mucosa are related to acute infections, they will show a seasonal variation. During the winter of 1940-1941, a high incidence of oral aphthous lesions was noted with the appearance of the mild influenza epi-

demic on the eastern seaboard. This was observed both in clinic patients and in those from private practice.

Herpetic lesions may develop during menstruation or pregnancy or in thyroid disease. All these conditions result in a greatly increased cellular metabolism and hence a greatly increased need for vitamin B complex. If the vitamin reserves, or supply, is not adequate, the local tissue resistance may be lowered to a degree which will permit the clinical development of the herpes lesions.

PATHOLOGY

Histopathologically, the early herpetic lesion consists of an elevated area of tissue composed of a fibrinous exudate within the epithelium. There is a moderate round-cell infiltration in the subjacent connective tissue. Intranuclear inclusion bodies, a characteristic of many of the virus diseases, are found in the epithelial cells of the primary lesion.[15]

SYMPTOMATOLOGY

The herpetic lesion presents characteristic local symptoms, usually noted before the appearance of the lesion. Frequently, there is a slight itching or burning sensation and a feeling of tenseness or fullness at the site of the developing lesion. The subjective symptoms are accompanied, or soon followed, by development of localized areas of hyperemia and vesicle formation.

The vesicles, which constitute the characteristic herpetic lesion, are filled with a clear yellow fluid. The solitary lesions may vary from the size of a pinhead to several millimeters in diameter. The vesicle stage is of short duration, especially in the mouth, where the rupture of the vesicles is accelerated by maceration in the saliva and mechanical trauma associated with the mastication of food. The vesicles or eroded areas are surrounded by a bright red areola. The lesions are extremely painful for their size. Eating may be difficult. There is usually an increase in salivary flow.

Multiple lesions may coalesce, forming large irregular shallow ulcers. Small tags of epithelium, the ruptured vesicle wall, may be found about the periphery. During the healing of the large superficial ulcerations, the lesions are covered with a thick yellowish cheesy material. If first seen in this state, they may present difficulties in diagnosis. The lesions usually disappear in from ten days to two weeks. If secondary infection occurs, or lesions develop repeatedly at the same site, slight scarring may result.

Herpes labialis or herpes genitalis presents similar symptoms, except that the vesicular stage is longer. The vesicles eventually rupture, a characteristic yellow crust remaining. The usual duration of the lesions is from ten days to two weeks, being little changed by any form of treatment with the possible exception of x-ray therapy.

DIAGNOSIS

The diagnosis of herpetic lesions can usually be made on the basis of the history of onset, the symptomatology and the characteristic appearance of the developing lesions. All lesions, especially those of the oral mucosa, may present difficulties in diagnosis to those unfamiliar with the peculiar appearance of the healing lesions. The thick yellowish cheesy appearance forms a striking contrast to the early stage of the mucosal eruption and to the familiar appearance of the healing lesions on the lips. Accompanying coryza or gastro-intestinal upsets may aid in confirming the diagnosis.

The differential diagnosis must consider herpes zoster, impetigo, erythema multiforme and allergic manifestations due to foods or drugs. The lesions in herpes zoster are rarely bilateral and are usually confined to an area corresponding to the distribution of some sensory nerve. Allergic reactions of a

herpetic (vesicular) nature can usually be ruled out by the short duration of the lesions, which, as a rule, disappear within twenty-four hours. A careful history as to the diet or medication, especially cathartics, is helpful.

In impetigo, the lesions are not confined to the mucocutaneous orifices, but may extend for some distance on the cheeks and lips. They may be on the hands, arms and neck as well as other parts of the body and are rarely confined to the oral mucosa. There is a predisposition to the disease in children. Subjective symptoms are minimal.

Erythema multiforme of the oral mucosa and lips may present a more difficult problem in differential diagnosis. The characteristic lesions have a raised border with a deeper red center. In the mouth, the lesions may take on a purplish hue. The tongue is commonly involved and the oral lesions are usually accompanied by dermal manifestations. The lesions do not begin as vesicles, and they are usually of much longer duration than herpetic manifestations. If the beginning lesions are studied, a differential diagnosis can usually be established. Prinz[17] recommends a therapeutic test with solution of potassium arsenite (Fowler's) as a diagnostic aid in doubtful cases.

TREATMENT

The solitary occasional aphthae are commonly treated with local applications of silver nitrate, zinc chloride, camphorated phenol, phenol, camphor ice or chromic acid. Touching the lesions frequently with an ordinary alum pencil will give symptomatic relief. The pencil is not caustic enough to produce scarring and it can be used safely by the patient.

In persistent cases or those with extensive involvement, other forms of therapy may be used. For the most part, they are beyond the province of the average dentist, consisting of the use of formalized herpes virus[17] injections of autogenous serum,[18] smallpox vaccinations, neoarsphenamine[19] or sulfanilamide[20] therapy and the intradermal use of moccasin snake venom.[21 22]

Roentgen therapy,[23] one-half to one-fourth skin erythema dose, will prevent the further development of the lesions if irradiation is carried out early. This form of treatment is more satisfactory in the occasional herpetic lesions of the lips. It is not recommended for the recurrent lesions. Roentgen therapy should be administered only by one experienced in this form of treatment.

Because there appears to be some group immunologic relations among the various virus diseases, recurrent herpes has been treated with smallpox vaccine.[24 25] At times, repeated vaccination is necessary to develop a sufficiently high antibody titer for therapeutic results. It is interesting to note that many patients who have recurrent herpetic lesions give a history of difficulty in getting a vaccination "take." This treatment, while quite effective, is not practicable for the average case.

In 1932, Gerstenberger[26] reported the successful treatment with yeast tablets of herpetic stomatitis and herpes labialis in children. Cases with marked lesions showed marked improvement within twenty-four hours and complete recovery in four days. This report was well documented with case histories. Cachera[27] reported satisfactory results from the administration of nicotinic acid and nicotinamide for oral aphthae. Cure took place in several days in cases that had been refractory as regards other treatment. Cachera suggested a possible connection between aphthae and pellagra in their relation to avitaminosis. Weisberger[28] described the pinpoint herpetic lesions (vesicles) on the buccal mucosa associated with B_2, or riboflavin, deficiency. No mention was made of the use of vitamin therapy in the treatment of herpes labialis or oral aphthae.

CLINICAL STUDIES

The therapeutic effect of the various components of the vitamin B complex was studied in cases of solitary aphthae, chronic habitual aphthae, herpes labialis and herpes genitalis in adults. The report is based on thirteen cases. Nine of these were from the student body or the clinic patients of the University of Pennsylvania Dental School. The four remaining cases were from the private practice of S. L. Rosenthal, who cooperated in this study.

It was difficult to evaluate accurately the therapeutic effect of vitamin B complex in several of the cases in which solitary occasional aphthae were treated. Both the patient and the dentist felt that this form of treatment definitely shortened the clinical course of the lesion. There were no recurrences in the entire group of cases, aside from those experimentally produced.

The cases of acute habitual aphthae occurring in the student body and in clinic patients afforded opportunity for critical study. The following case histories are representative of this group.

REPORT OF CASES

CASE 1.—One of us (G. C. H.), aged 25, had habitual aphthae whenever Philadelphia was visited. The lesions usually appeared on the fourth or fifth day after arrival. They were apparently related to the local drinking water. The aphthae, which were recurrent as often as twelve times during a period of eight months, were usually multiple and had a predilection for the mucous membrane of the lip opposite the mandibular canines. They were extremely painful and persisted for from seven to ten days.

The development of the aphthae could be felt prior to their clinical appearance. If 5 mg. of thiamine chloride was taken, the vesicles that appeared just ready to rupture at bedtime would be completely gone in the morning. Slightly thickened fibrous areas remained at the site of the lesion. No pain was experienced. The oral administration of thiamine chloride 5 mg. a day for several days resulted in complete resolution. The ingestion of six yeast cakes a day did not affect the development or course of the lesions.

Repeated experimentation by this subject demonstrated that the usual clinical course of the various stages of the lesion could be aborted and the size of the aphthae could be definitely reduced by the administration of thiamine chloride. In the case of aphthous ulcers the size of a pinhead, there was prompt decrease in size and complete disappearance of the lesion within twenty-four hours.

Further experimentation with the riboflavin and nicotinic acid fractions of the B complex demonstrated conclusively in this particular case that thiamine chloride was the specific agent which prevented development of the lesions. Riboflavin or nicotinic acid alone or in combination did not prevent them. The patient presented none of the clinical symptoms of a nutritional deficiency.

CASE 2.—H. H., a man, aged 23, complained of a solitary aphthous lesion on the oral mucosa of the cheek, of two days' duration. It was very painful on movement of the cheek or tongue in that area. The oral administration of 5 mg. of thiamine chloride the first day and 3 mg. the second day resulted in complete disappearance of the lesion within forty-eight hours. There was no recurrence after the cessation of thiamine chloride administration.

CASE 3.—S. P. D., a man, aged 23, could produce aphthous lesions at will within a twelve to forty-eight hour period by eating English walnuts. The lesions usually appeared in pairs, most often opposite the lower anterior teeth on the labial mucosa. The oral administration of 3 mg. of thiamine chloride per day caused every formed aphthae to disappear within from twenty-four to forty-eight hours, and when the same dosage was employed as a prophylactic measure, the aphthous lesions failed to appear even though English walnuts were eaten. However, there were thickened areas in the usual sites. The thiamine chloride was continued through the following day to insure that these areas would not go into the vesicle stage.

CASE 4.—M. J., a colored woman, aged 21, complained of chronic recurring "canker sores," which developed in three specific

areas of the mouth in definite rotation. They were unrelated to the menses. There was no relation to food allergy that could be elicited by the history. The oral administration of B complex tablets* prevented the development of the lesions over a period of two months. When the oral administration of the vitamin preparations was stopped, the lesions returned. The patient would not cooperate to the extent of following dietary suggestions.

CASE 5.—H. L., a man, aged 26, had frequent and severe attacks of herpes labialis. The lesions were very extensive and not only involved the mucocutaneous margins of the lips, but also extended to the nares. They normally lasted from ten to fourteen days. An attack was aborted when B complex preparations were administered on the second day, and no trace of the lesions was present on the fifth day. This therapeutic response was greatly appreciated as the lesions began the week of an important social event. Dietary regulation and small maintenance doses of all the vitamins prevented the development of further attacks of herpes labialis.

CASE 6.—H. W., a man, aged 21, referred to the dental school from the student health service of the University of Pennsylvania, presented large cheesy appearing yellow lesions throughout the mucous membranes of the cheeks, tonsillar crypts, posterior pharyngeal wall, tongue and sublingual space. Extensive lesions consisting of flattened yellowish crusts were present on the penis. The condition was of two days' duration. New lesions were continuing to form. In the oral cavity, the typical vesicular appearance of herpes was observed, as well as the cheesy yellow areas characteristic of healing coalesced lesions. The patient did not complain unduly of pain. There was marked increase in salivary flow.

A careful medical history, physical examination and laboratory studies including serologic studies performed by the student health service were negative except for the lesions described and a mild febrile reaction. The patient was given high B complex therapy equivalent to 50 mg. of thiamine chloride, 50 mg. of riboflavin, 250 mg. of nicotinic acid, 250 mg. of calcium pantothenate and 100 mg. of pyroxidine hydrochloride per day for three days. The therapeutic response was excellent. On the third day, the penile lesions and all the oral lesions had completely disappeared with the exception of one small ulcer. This remaining ulcer quickly disappeared and there was no recurrence after vitamin therapy was stopped, on the third day.

This dosage might have been unnecessarily high, but when vitamins are administered by mouth, only a small fraction of the ingested dose can be absorbed and become therapeutically effective. The clinical response in this instance was striking, and no "flushing reaction" or other side effects were noted.

It is of interest to note that this student's roommate had a "canker sore" a week before the patient came down with the acute herpetic stomatitis and herpes genitalis.

COMMENT

Our findings are in agreement with those reported by Gerstenberger relative to the satisfactory treatment of herpetic stomatitis and other herpetic manifestations with vitamin B complex. Gerstenberger used vitamin C-free yeast tablets in his studies and his dosage of B complex using this source of vitamin was much lower than that which we used. Whereas his series was composed of children, our study was made entirely on adults. In some of our cases, it was definitely shown that thiamine chloride was the antiherpetic factor of the B complex.

We do not consider that the favorable therapeutic response of the various herpetic manifestations under B complex therapy negates the virus etiology of these conditions, which has been firmly

*The B complex used in this study was made available through the cooperation of D. F. Robertson of the medical department of Merck and Company, Inc. The TRN6P tablets used each contained: 5 mg. thiamine hydrochloride; 5 mg. riboflavin; 25 mg. nicotinamide; 5 mg. pyridoxine hydrochloride, and 25 mg. calcium pantothenate dextrorotatory.

established by numerous immunologic studies. Following the initial herpetic infection, which probably always occurs in childhood, varying degrees of immunity to the virus are established. A wide variety of predisposing conditions may produce clinical herpetic lesions in persons with a low antibody titer or in those whose cellular resistance has been lowered through some physiologic or pathologic condition.

Holt[29] believes that herpes is caused by something which acts on the terminal nerve filaments. Since it is known that thiamine has definite antineuritic properties and is necessary for the integrity of nerve tissue, it may have some specific action. It is more likely that, through its effect on cellular metabolism, the B complex prevents recurrence and causes prompt regression of developing lesions. Herpetic manifestations should not be considered a specific symptom of B complex deficiency in the same category as cheilosis or pellagra. Consequently, not all herpetic manifestations will be improved. This has been the case in one instance of herpes following exposure to the sun.

The crystalline components were used in this study to furnish data on the required therapeutic dose and to determine the relative importance of the various fractions of the B complex in the treatment of herpetic lesions. Spies[30] has shown that a deficiency of a single component of the B complex is rare—a multiple deficiency is nearly always present—and the therapy should be governed by this concept and include all the fractions of the complex.

Natural sources of the vitamins are to be desired, especially for maintenance purposes. If the diet is to be regularly fortified with the B complex, it is well to use yeast preparations, many of which are satisfactory for this purpose. Several of our patients were able to prevent the recurrent herpetic lesions by slight dietary changes and the restricted consumption of foods or drinks that require a marked increase in cellular metabolism and thiamine utilization.

For the treatment of solitary herpetic lesions, the more concentrated preparations will do no harm if not administered for more than a few days or a week. For therapeutic results, 5 mg. of thiamine chloride, 5 mg. of riboflavin and 50 mg. of nicotinic acid per day was usually found to be satisfactory. The case of acute herpetic stomatitis and genitalis was treated with a much higher dose. Excellent therapeutic response was obtained and no undesirable reactions were noted. It should be mentioned again that, in all oral vitamin therapy, the ingested dose may represent many times the amount of the preparations that is absorbed and therapeutically active.

Thiamine chloride or the B complex is not recommended for the treatment of the painful scarring recurrent lesions of the oral mucosa that are frequently called periadenitis mucosa necrotica recurrens. These are not to be confused with the traumatic lesions frequently resulting from cheek biting associated with local anesthesia.

SUMMARY

In the various herpetic manifestations, herpes labialis, solitary and recurrent aphthae and herpetic stomatitis and genitalis, the use of vitamin B complex, and in some instances thiamine chloride alone, not only had a prompt therapeutic response, but also was effective in preventing recurrent lesions when other forms of conservative therapy had been ineffective.

Thiamine chloride, 5 mg., riboflavin, 5 mg., and nicotinic acid, 50 mg., or their equivalents, per day for several days gave prompt and satisfying results in cases of solitary herpetic lesions. Recurrent herpetic aphthae were controlled by dietary changes or a maintenance dose of 1 mg. of thiamine chloride per day.

Natural sources of the vitamins are recommended for maintenance purposes.

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THE VERTICAL DIMENSION

By JEROME M. SCHWEITZER, D.D.S., New York, N. Y.

IN recent years, the importance of the vertical dimension has been realized and much serious thought has been given to it. By vertical dimension, we mean the distance between the base of the nose and the undersurface of the chin when the teeth are closed. Normal vertical dimension is that dimension in a young adult, with the teeth fully erupted in closed position, between the base of the nose and the bottom of the chin. The difficulty in describing the vertical dimension lies in the fact that many conflicting factors may be involved. The closed position of the teeth is chosen rather than the physiologic centric position because the former eliminates the free-way space. The exact dimensions of this space no one has yet been able to determine accurately. The nose-to-chin position is taken arbitrarily, as the nose and chin seem to be guiding landmarks. Other positions, such as the dentino-enamel junction of the upper and lower teeth when in closed position, may be taken, but the teeth from which to make this measurement are not always present. From the ridge of the nose to the base of the chin is acceptable with the teeth in closed position, but that fact only makes the possibility of error greater on account of the additional length of the measurement. A young adult is chosen to determine the normal, because the teeth are fully erupted and have not had sufficient chance to wear down, and so we may accept that position as our starting point. In a healthy young adult with a full complement of upper and lower teeth, a normal vertical dimension is the usual finding.

Let the analysis be carried a step farther. There are many different types of bites: the deep bite, the prognathic bite, the slight overbite, the tip-to-tip bite, the slight overbite with overjet and many modifications of these bites. By a normal overbite, we mean the normal overbite for one individual; that bite which is in harmony with the surrounding mechanism, what is apparently an abnormal bite being perfectly normal for the mouth for which it was intended. It is only when, because of lack of harmony between the bite and the rest of the dental apparatus, the dental organism begins to break down that we are dealing with the abnormal. Normalcy includes, in addition to the manner in which the teeth close, a condyle which rests within the glenoid fossa in such a manner that it is in harmony with its surroundings and works with the bite. It also includes a set of elevator and depressor muscles which so act upon the mandible as to assure a harmonious relationship between the above-mentioned structures. A normal vertical dimension, therefore, assures a facial expression which is harmonious because all the muscles are in correct tone.

These are instruments designed to indicate what the correct vertical dimension is for each individual. This dimension, which is said to be the same for all, is as follows: The distance from the center of the pupil of the eye to the center of the corner of the mouth is equal to the distance from the base of the nose to the undersurface of the chin measured vertically. These distances do approximately equal each other in many indi-

viduals, but, in some, they do not, and if, therefore, they are used indiscriminately, many mistakes will result. This relationship is particularly misleading in the case of deep bites, when the lower third of the face is much smaller than with other types of bites. The vertical dimension, in cases of deep bite, deserves special consideration. Whether the deep bite is the result of the tardy eruption of the posterior teeth, while the anterior teeth continued to erupt, or the overdevelopment of the anterior segment, is debatable.

We do know that, posteriorly, the vertical dimension is exactly as seen in almost any mouth; whereas, anteriorly, the distance from the labial cervical margin of the upper incisor teeth to the same margin of the lower incisors is far less than what is usually expected. The overlapping of these anterior teeth causing this short vertical dimension makes it necessary for the patient to bite almost entirely in an open-and-closed movement without definite lateral or protrusive movements. The mandible works beneath the maxillae somewhat like a mortar beneath a pestle. If the mandible is much smaller than the maxillae, it has more movement within the upper arch. Usually, the glenoid fossae is also deep and the condyle head is well within the fossae. The sagittal registrations are correspondingly acute because the articular eminence is well defined. Considerations much the same as these can be carried over to the prognathic cases, where the same development of the processes occurs, but in reverse order.

When the vertical dimension is normal, the mandibular maxillary joint is normal. The condyle works harmoniously within the glenoid fossae. The articular disk is normal and the muscular attachments are so arranged that the mandible is perfectly balanced beneath the maxillae, both in physiologic and in physical centric positions.

Up to now, we have dealt with the normal—not, to be sure, an arbitrary normal, but rather a normal that produced harmony of function for the individual. To go farther, we must see what happens when the vertical dimension is either abnormally short or abnormally long; in other words, abnormal.

Assuming that there is no injury and no loss of teeth, let us see what happens with a normal tip-to-tip bite as the patient gets older and the cusps begin to wear down. This is a process which takes place in every mouth. The vertical dimension becomes shorter, more so in the anterior region, which is further from the hinge axis than in the posterior region. The periodontal structures remain normal. The origin and insertion distance of the various muscles is changing with the change in the vertical dimension, and here there is a disturbance of muscular balance. Since it usually takes a long time for the tooth structure to wear down, any slight discrepancies in the vertical dimension will be compensated by the ability of the muscles to make adjustments. The same condition prevails within the joint itself, where any slight difference is compensated without any apparent pathologic condition, but there are many instances in which this continued decrease of the vertical dimension reaches a stage in which it is no longer within the power of the joint or the muscles to take up the slack, and it is in this stage that disease starts.

The great difference between the physical and physiologic centric positions greatly enlarges the free-way space. The great distortion of the muscles creates a difference in the pull of the mandible against the maxillae; which, in turn, causes unequal wear of the tooth cusps, changing the physical centric contact and resulting in a functional bite which may be entirely out of harmony with the rest of the mechanism. This functional bite causes a corresponding change in the joint cavity, which may manifest itself

by increased pressure on one side and decreased pressure on the opposite side, leading to thinning of the meniscus, wearing away of condylar bone and wearing away of the articular eminence, the joint eventually becoming entirely different from the original joint. Usually, one side is different from the other side. This lack of joint muscle and cusp harmony must result in a physiologic rest position of the mandible beneath the maxillae different from that assumed when everything was normal, even though we are told that this position never changes. It cannot possibly remain the same. The question that arises is this: In restoring these distorted cases, when a centric registration is taken, is it not this distorted registration that is obtained? If normal specialized tissues have been destroyed, is it possible to recapture the original mandibular position? Since this is only an analysis of the vertical dimension and not a discussion of treatment, it is not at present necessary to become involved in the question of treatment.

In the case of deep bite, shortening of the vertical dimension will be attended by additional symptoms. The mandible here is working underneath and within the maxillae. The lower anterior teeth will strike the lingual gum directly behind the upper anterior teeth. Their labial surfaces and the corresponding lingual surfaces of the upper anterior teeth will be abraded. The buccal surfaces of the lower posterior teeth and the lingual surface of the upper posterior teeth will be worn. Usually a spreading of the upper teeth, due to the pressure of the lower wedge, is present. In addition, of course, all the manifestations mentioned before are present here. This breakdown due to decrease in vertical dimension may manifest itself in severe physiologic disturbances, owing to a disturbance of function, which would, of course, include the nervous system.

Prognathic cases would be similarly affected, but in reverse order to the deep-bite cases. Here, with a decrease in the vertical dimension, the lower anterior teeth may spread and the lower anterior segment of the mandible may move forward and upward. The condyle in the fossa should correspondingly come downward and forward on the same arc.

The result of these bone changes are only too evident when an attempt is made to restore the vertical dimension. The bone has been bent, the muscles have been distorted, the joint has been changed and the greater the mutilation, the more muddled the picture when the treatment is attempted. Large overjets present themselves. One arch may seem entirely out of harmony with the opposite arch, and the mandibular maxillary joint may be so altered that the patient will continually register a functional bite or perhaps an altered rest position of the mandible.

Usually, these cases which start off with a small overbite, owing to a drifting forward of the mandible with wear, end with a tip-to-tip bite. They are the easiest cases to restore to normal by increasing the vertical dimension, because the changes have been fewer.

Many changes take place within the joint. With a decrease in the vertical dimension, the condyle may gradually be pushed upward and backward into the glenoid fossae, with destruction of portions of the fibrocartilage. There may be pressure against the posterior portion of the glenoid fossa and indirectly against the external ear. There may be pressure against the tympanic nerve. There may be erosion of the head of the condyle. There may be erosion of portions of the articular eminence. Many of these changes are permanent and the original condition can never be restored.

A decrease in vertical dimension, as was said before, alters the original insertion distance of the elevator and depressor muscles of the mandible as well

as the accessory muscles. When the vertical dimension is again increased, these muscles are said to return to normal. It is more probable that they are better able to accommodate themselves to new positions than to return to their normal, old positions, because, with the changed picture, who can say with certainty what this position was? Muscle is specialized tissue: it may be stretched and it may be contracted; but once it reaches its full growth, it cannot grow new muscle tissue. For that reason, if the vertical dimension is increased beyond the original and insertion distance of the muscle, the muscle will continue to contract until it reaches the normal distance and tissue destruction may be caused in its doing so. But here again, much investigation is necessary, and it would be wise to spend much time in studying these cases of altered vertical dimension instead of exercising a too hasty judgment in attempting to correct them.

730 Fifth Avenue.

GOLD FOIL: ITS SELECTION, CHARACTERISTICS, MANIPULATION AND INSERTION

By ERLING THOEN,* D.D.S., Iowa City, Iowa

THE detection of dental caries, the most prevalent of all diseases of the human body, demands immediate attention because the consequences of uninterrupted dental decay often lead to disturbing systemic conditions. Many members of the profession, as well as those of other professions concerned with the healing art, are constantly striving to determine methods of preventing dental diseases. Much has been accomplished through dietary and other measures, but there remains the all important necessity of proper attention to existing caries.

In making restorations in teeth, the dentist must keep in mind that he is in duty bound to render the best service possible under existing conditions. His efforts must not be devoted solely to the removal of carious tooth substance and the filling of the cavity with the most conveniently manipulated material. He must seriously consider the preventive as well as the restorative phase of the operation, and exert every effort to meet the requirements of both. The interruption of caries, provision for resistance against the forces of mastication, prevention of recurrent decay, establishment of correct occlusion and contour and development of pleasing esthetic effects are all important. These accomplishments demand, among other things, the selection of appropriate restorative material.

When selecting a restorative material, the operator should consider the conditions which he is obliged to meet. He must keep in mind the fact that all materials have both desirable and undesirable characteristics, and that he is largely responsible for the selection of the material to be used in each case. Of course, he may occasionally be obliged to yield

*Professor of operative dentistry, University of Iowa, College of Dentistry.

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to the wishes of the patient and refrain from the use of the material which he deems best.

Unfortunately, we do not have available any material for the making of permanent restorations which can be regarded as ideal. If such material were obtainable, it should possess the following characteristics:

1. It should be perfectly adaptable to all parts of the cavity.
2. It should not be affected by the fluids of the mouth.
3. It should possess sufficient crushing resistance and edge strength.
4. Its resistance to attrition should correspond to that of the enamel.

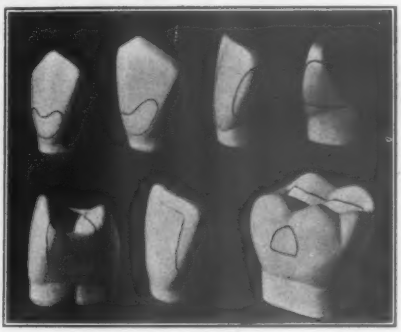

Fig. 1.—Outline forms.

5. Its color should harmonize with that of the enamel.
6. It should be a non-conductor of thermal impressions.
7. It should be so constituted that it would take and retain a satisfactory surface finish.
8. Its volume changes should correspond to those of the hard tissues of the teeth.
9. It should be easily tolerated by the hard tissues of the teeth and by the soft tissues of the mouth.
10. Its manipulation should be a comparatively simple procedure.
11. Its cost should not be prohibitive.

Considering these properties collectively, it can be seen that we do not now have any material which can be regarded as completely satisfactory for all types of restorations. We do, however, have materials which lend themselves to the restoration of certain parts of the oral cavity which can be regarded as rather satisfactory for the particular types of restoration for which they are primarily intended.

Let us consider the characteristics of gold foil in relation to those of the ideal restorative material, in order to gain a better understanding of gold foil, an excellent material in many permanent restorations.

Gold is not affected by the fluids of the mouth. There is absolutely no tendency toward dissolution of this material by the saliva or any other fluid that is taken into the mouth. This property is necessary to all materials, since it is one of the principal factors in the permanency of a restoration.

Fig. 2.—Resistance and retention forms.

Gold takes and retains a satisfactory surface finish, an essential to the maintenance of oral cleanliness and the prevention of recurrence of decay.

No unfavorable volume changes occur after gold foil restorations are completed. Neither shrinkage nor expansion to any appreciable degree can be tolerated in any restorative material.

Gold foil possesses the most desirable property of being perfectly adaptable in all parts of the cavity. This, together

with its freedom from volume change, makes for perfect sealing of the cavity. There will be no recurrence of decay in any cavity in which gold foil has been properly placed.

Gold foil restorations resist attrition in a generally satisfactory manner.

One of the important considerations with any material is edge strength and the ability to withstand the forces of mastication. Gold foil restorations afford sufficient edge strength, and offer sufficient resistance to the forces of mastication. No other material possesses these properties to a higher degree, with the possible exception of some of the alloys used in the construction of cast gold inlays.

The hard tissues of the teeth tolerate gold in any form. Pulp disturbances

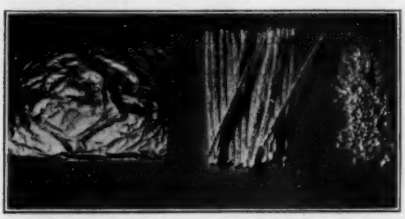

Fig. 3.—Forms of gold foil: sheets, ropes and manufactured pellets.

under gold foil are no commoner than under other metallic materials.

The unfavorable properties of gold foil are few. Its color may not be particularly pleasing when in contrast with tooth tissue, but, in many cases, this can be corrected by special attention to the outline form of the cavity. A minimum degree of extension of cavity margins, consistent with prevention of recurrence of decay and convenience of insertion of the material, should be made. In addition, esthetic values can be assured by due consideration to the contour in finishing gold foil restorations.

The only other objectionable property of gold is its thermal conductivity. In foil, this objection is no greater than in any other form of the material. Unfortunately, all metallic restorative materials are conductors of thermal impressions. This property can be minimized in many cases if unnecessary sacrifice of tooth substance is avoided, or it may be eliminated entirely in some instances through the use of intermediate substances such as cavity linings and cement bases. It might be well at this point to emphasize the advisability of encouraging patients to give early attention to incipient decay. Too often, patients are dismissed, after an examination, with instructions to return later for the treatment of initial decay. In addition to the usual discomfort accompanying preparation of cavities, the thermal changes naturally occurring in the mouth will

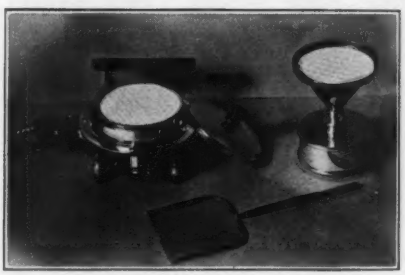

Fig. 4.—Annealing appliances.

make for pain, in proportion to the depth of the decay and the size of the cavity.

We occasionally hear members of the profession state that they do not use gold foil because of difficulty of manipulation. It seems unreasonable to offer such an excuse for not using this excellent material. It is true that the use of gold foil in a satisfactory manner requires observance of a rather exacting technic, but what other material do we have which does not require similar consideration for a completely satisfactory result? Certainly, no one would think of disregarding the specific instructions for the preparation and insertion of other materials if he thought that the end-result would

be unsatisfactory. Let us disregard this so-called objection to gold foil and give attention to mastering the procedure involved in foil restorations. Gold foil deserves this consideration.

Gold foil is indicated in all classes of cavities. Owing to improved technics and the selection of other materials available, it may be said to be indicated in many pit and fissure restorations, proximal restorations of the anterior teeth and restorations of the gingival one-third of the labial, buccal and lingual surfaces. Because of certain advantages of the cast gold inlay over gold foil, the inlay may be given the preference in selected cases. The above-mentioned cavities can often be more quickly and easily filled with gold foil than with a cast gold inlay, and the restoration will be more satisfactory. The time element is of importance in every operation, but of greater importance is a perfectly sealed cavity. Every operator appreciates the tendency to recurrence of decay around fillings, and he should attempt to prevent this by perfectly adapted restorations with the most dependable material. Gold foil serves well because of its extreme adaptability to cavity walls, angles and margins.

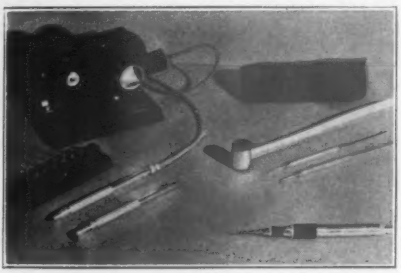

Fig. 5.—Condensing instruments.

In selecting gold foil as the restorative material, the operator should take into consideration the following: (1) strength of the cavity walls; (2) condition of the supporting structures of the tooth; (3) accessibility of the cavity; (4) esthetic requirements, and (5) physical condition and age of the patient.

The enamel walls of the cavity should be, as far as possible, supported by sound dentin. Since considerable force is necessary to proper insertion of gold foil, enamel should seldom be left unsupported. There are occasions when, for esthetic reasons, a part of a wall may be left unsupported by dentin. If the structure of the enamel is such that the gold beneath it will not be seen through the enamel, and if this enamel will not be subjected to the forces of mastication, dentin support may not be necessary. In such a case, the operator must exercise due precaution in applying force when condensing the gold in that part of the cavity.

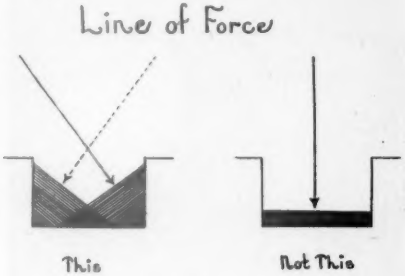

Fig. 6.—Line of force.

The supporting structures of the tooth should be reasonably healthy, since pathologic conditions involving the peridental membrane may be aggravated by the force necessary to obtain condensation of the gold.

The accessibility of the cavity has been an important factor in determining whether gold foil is to be used. However, through the introduction of the pneumatic condenser, this factor can be eliminated in many cases.

Occasionally, gold foil operations are rather trying on the patient because of the necessity of maintaining quiet. Therefore, it is possible that the placing of gold foil should not be attempted in the

teeth of young people unless the disposition of the patient will permit the use of an exacting technic. Also, in young patients, the degree of root development should be taken into consideration. Teeth with completely developed roots are to be preferred because there is then no danger of disturbing the health of the tissues in the apical area in condensing the gold.

For aged and infirm patients, gold foil may be ruled out because of the life expectancy of the tooth. Nervous and excitable people may be difficult to handle, but usually, with tact and judgment in handling them, satisfactory gold foil restorations can be made without any detrimental effect.

Fig. 7.—Outline forms for cavities.

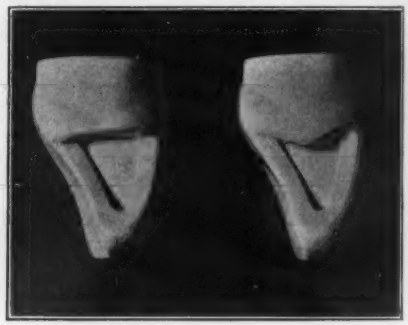

Fig. 8.—Proximal aspect of prepared cavities.

The preparation of a satisfactory cavity for the reception of gold foil, and minimizing of the possible difficulties which might be encountered in making the restoration, requires, in some instances, the separating of the teeth. This may be accomplished by either the "slow method" or the "immediate method." Slow separation may be obtained by tying cotton cord around the contact point between the teeth, dismissing the patient for several hours, and depending on the saturation of the cord with saliva to bring about separation. Obtaining space in this manner is highly recommended because, in most cases, it causes little soreness and there is little danger of injury to the supporting structures of the teeth. When separation is effected in this manner, the space is maintained by applying the mechanical separator before beginning the operation. If time will not permit separation by the slow method, immediate separation can be obtained with the mechanical separator, preceding the preparation of the cavity.

The use of the rubber dam for all gold foil operations is a necessity for better cavities, prepared with greater ease and more accuracy, and with less discomfort to the patient. Of course, its application is absolutely essential to introduction of the gold into the cavity. If gold comes in contact with the saliva, the cohesive property of the material will be destroyed. The operator will be well rewarded for the time spent in applying the dam.

An understanding of cavity preparation is necessary to satisfactory gold foil restorations. The requirements for retention, preventing recurrence of decay and esthetic values will have to be considered. G. V. Black gave the profession its first practical system of cavity preparation. Compliance with this system will make for satisfactory cavities. With no attempt at a detailed discussion of

gold foil cavities, it might be well to briefly review the requirements for such cavities if the restorations are to be satisfactory.

Preceding every operation, the occlusion should be carefully examined. The relation of the tooth to be operated on to the adjacent teeth and its occlusion with the tooth, or teeth, in the opposite arch should be noted. This is important because the findings may influence the outline form of the cavity, and, in many cases, determine the cavity form in general.

The outline form of the cavity, which means the area of the tooth surface to be included within the enamel margins of the cavity, should, as far as possible, be predetermined. (Fig. 1.) In all cases, it should be such that the margins will lie in immune areas; that is, areas that are habitually clean. These areas include the line angles of the crowns of the teeth, the apical two-thirds of the cusps, marginal ridges, the points of greatest convexity and areas incisally or occlusally from them, and under the so-called free margin of the gums. These areas are habitually clean because most of them are constantly swept by food, or they are cleansed by the movements of the tongue, cheeks and lips. Also, they are rather easily reached with the toothbrush. When considering the cavity outline form for restorations which will probably be exposed to view, attention should be given to the esthetic requirements. It frequently happens that the latter consideration will prevent the exposure of so much gold as to be unsightly.

Resistance and retention form, wherein provision is made for absorption of the stresses of mastication and retention of the filling, must be correct. (Fig. 2.) Adherence to irregular box-forms seems advisable. Flat walls and definite angles, with dovetailing when necessary to prevent displacement, not only increase the resistance against the forces of mastication and the retention, but also minimize any difficulty in inserting the gold.

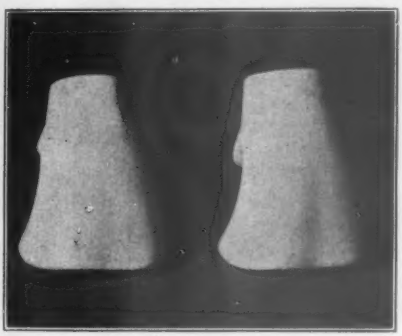

Fig. 9.—Labial aspect of prepared cavities.

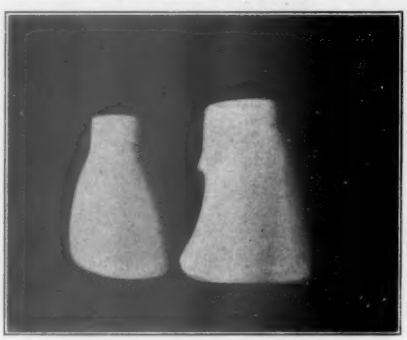

Fig. 10.—Labial aspect of tooth after separation has been obtained.

Convenience form includes such slight modifications in the form of the cavity as may be necessary to placing and condensing the gold, also cutting convenience angles in the surrounding walls of the cavity, which will serve as starting points for the gold. These angles should be definitely cut, of reasonable size and not too deep. They should be cut entirely within the dentin of the surrounding walls. The mistake should not be made of cutting these angles in the floor of the cavity whether this is the axial, pulpal or gingival wall, because, if so placed, they could not serve the purpose for which

they are intended. It is a good rule to so place the convenience angles that they will oppose one another.

The enamel margin of the cavity should be beveled to remove short and loose enamel rods, which may break down during condensing of the gold, or fall out subsequently to completion of the restoration. A bevel of approximately one-fourth the thickness of the enamel on the surface of the tooth and a like distance on the wall of the cavity is usually sufficient.

Attempts to sterilize the cavity through the use of antiseptics or germicidal agents should not be necessary if the rubber dam has been applied during its preparation. Black has stated that the most nearly sterile cavity walls are those which are freshly cut. It seems best to accept this statement and refrain from the use of sterilizing agents.

Absolute cleanliness is essential to the preparation and insertion of gold foil. Instruments used in handling and inserting the material should be thoroughly cleansed in advance of their use. It must be remembered that the cohesive property of the foil, when restored, is easily lost through the slightest contamination. The manufacturers of gold foil take every precaution to see that the gold reaches the dentist uncontaminated, and that annealing is all that is required to make the gold cohesive.

Gold foil is obtainable in the form of sheets, ropes and uniformly prepared pellets, usually called cylinders. The number used in designating the sheets of foil, which are approximately 4 inches square, indicates the number of grains of gold per sheet. The most commonly used is No. 4. The sheets of gold are divided and rolled into ropes of uniform diameter each containing one-fourth, one-half or three-fourths of a sheet. The operator cuts the ropes into pellets of desired length. The so-called cylinders are really prepared pellets and their size is indicated by a number representing the size of the rope from which they are made. (Fig. 3.)

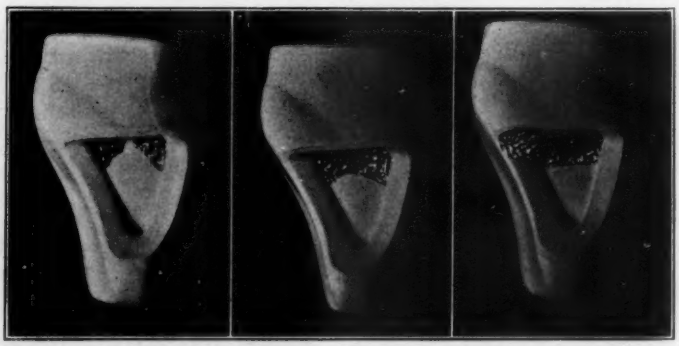

Fig. 11.—Left: Labial and lingual convenience angles filled. Center: Gingivo-axial angle filled. Right: Beginning filling of linguogingival angle.

Experienced gold foil operators have different preferences as to the form of gold. Some prefer pellets, which they themselves or their assistants prepare; others prefer the manufactured ropes, which they cut into pellets, and others prefer the manufactured pellets.

The operator prepares his own pellets by cutting the sheets of gold into pieces, each containing one-sixteenth, one-thirty-second or one-sixty-fourth of a sheet, rolling the pieces with the fingers to form spherical masses of gold of the desired diameter. Pellets so prepared should not

be rolled too tightly because of the possibility of difficulty in developing the cold-welding property. Also, the use of too tightly rolled pellets interferes with the distribution of the gold during the building procedure.

For the operator who does not have an assistant whom he can train in preparation of the gold; or who, for other reasons, wishes to dispense with this part of the procedure, the pellets prepared by the manufacturer are very satisfactory.

Whether gold foil, as received from the manufacturer, is labeled cohesive or non-cohesive, it requires annealing to develop the cold-welding property when this is desired. While either cohesive or non-cohesive foil may be used for certain restorations, the use of non-cohesive foil alone has been virtually abandoned. Because of its extreme softness, non-cohesive foil may be used for a part of some restorations to insure adaptation of the material to cavity margins. Also, because of the possibility of introducing a considerable quantity of gold into the rather inaccessible part of some cavities in a comparatively short time, non-cohesive foil in the form of cylinders can be used. (Fig. 4.)

The cold-welding property of gold foil may be developed by any one of three methods. The foil may be subjected to the open flame; it may be placed on mica or porcelain and suspended above a clean gas or alcohol flame, or it may be heated with an electric annealer. The open flame method requires the use of a clean fuel, preferably grain alcohol, burning in a clean lamp. Most of the denatured alcohols are not satisfactory for this purpose because of the possibility of contamination of the gold by the denaturing agents. Three undesirable possibilities will have to be considered in annealing in this manner. First, there is the possibility of contamination of the gold as already mentioned; secondly, the gold may be overannealed, with resultant harshness, and the gold may even be fused, and, thirdly, the gold may be underannealed, which would prevent development of the cold-welding property. However, experience with this method will eventually result in a satisfactory method.

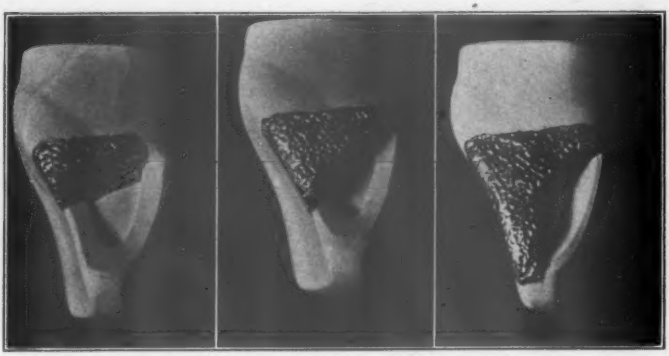

Fig. 12.—Left: Linguo-axial angle filled and gingival margin lapped. Center: Labiogingival margin lapped. Right: Lingual margin lapped, lingual line angle restored and incisal retention angle filled.

Annealing gold on mica or porcelain over an open flame will be quite satisfactory, but the use of a dependable electric annealing appliance is superior because there will be no danger of contamination of the gold attributable to the appliance, and little danger of overannealing if proper attention is given to

the time during which the gold is subjected to the heat.

In making any gold foil restoration, it is the expectation or intention of the operator to: (1) secure the greatest possible density of the mass of gold in the cavity; (2) obtain the best possible adaptation of the material to all parts of the cavity, and (3) place in the cavity sufficient gold for correct contour when the restoration is complete.

The density of a mass of gold employed in a restoration may not equal that of the cast gold inlay because of the lack of one or more of the conditions necessary to attain such density. The density will be governed, first, by the character of the resistance to the force used in condensing the material; secondly, by the area over which the force is expended, namely the size of the condenser points used, and, thirdly, by the kind and amount of force used in condensing.

Healthy tissues and strong cavity walls will, of course, tolerate more force than will diseased tissues and weak or unsupported walls. Therefore, the condition of the peridental membrane and the strength of the surrounding walls of the cavity are to be considered in determining the amount of force that can be safely applied.

Of considerable importance in attaining the desired density of gold is the size of the condenser points used. Black has emphasized this by stating that doubling the diameter of the face of the condenser point necessitates increasing the force four times, to obtain the same density. For this reason, then, it is advisable to use the smallest condenser points possible to be consistent with good operating and conservation of time in placing the filling.

Condensing force may be applied by the assistant while the operator manages the condenser point; or condensation may be obtained with the automatic mallet or with the pneumatic condenser. Black says,

Fig. 13.—Left: Contact point restored. Center: Labial margin lapped. Right: Labial line angle restored.

Of the different plans for applying mallet force, the hand mallet used by the assistant is by far the best, as it will produce the desired results with the least wear and tear to both patient and operator. The next best, but much inferior method is by use of the automatic mallet.

The pneumatic condenser, which was recently introduced, is an excellent appliance and will serve in a very satisfactory manner for condensing gold foil. This instrument, because of its straight and angle handpieces, makes possible the placing of gold foil in many cavities which in the past have been regarded as

too inaccessible to permit operating in a satisfactory manner. Also, experience has shown that its use causes little discomfort to the patient, a factor to be considered in selecting gold foil as the restorative material. (Fig. 5.)

In any gold foil restoration, there is probably no part of the procedure of greater importance than the constant application of a correct line of force in condensing the gold. (Fig. 6.) The line of force means the direction in which the force is applied. Generally speaking, the force should be so directed as to drive the gold toward the line angles of the cavity rather than toward the individual walls. In other words, the force should

Fig. 14.—Labial aspect of restoration before polishing.

parallel an imaginary line bisecting the angle formed by the junction of the surrounding walls with one another and with the axial or pulpal wall. Of course, it may be necessary to apply the force directly toward an individual wall in some part of the procedure. The location and degree of exposure of the cavity influence, to some extent, the line of force, and they may be so related to the procedure as to require the application of the line of force directly toward some cavity wall. Without considering some specific type of restoration, it is rather difficult to give a detailed discussion of the line of force. Emphasis has been placed on this consideration because only by its correct application can perfect adaptation of the material to the cavity be obtained.

Intimately associated with the application of the correct line of force are other considerations. Following the anchorage of the gold in the convenience angles, attention should be given to deposition of the gold for the main body of the restoration. The logical procedure is to immediately begin placing gold in the most inaccessible part of the cavity. This is advisable, since, otherwise, there may be interference with the filling of this part of the cavity later on. To disregard this suggestion only invites diffi-

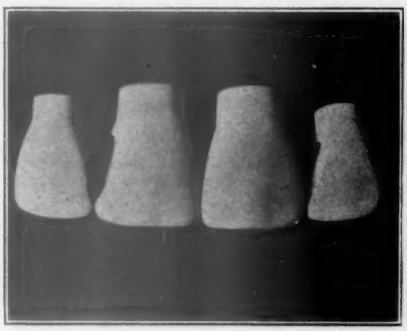

Fig. 15.—Labial aspect after polishing.

culty and dissatisfaction with the remaining part of the procedure and the final result.

The condensing procedure should be carried out in an orderly maner. With an appreciation of the extreme malleability of pure gold, we should, in some manner, try to use this characteristic to advantage, constantly beginning condensation of the pellets at or near their center or near the center of the mass of gold, and gradually working toward the periphery of the mass. In so doing, it is advisable to properly step the condenser point; that is, move the point approximately one-half its diameter for the suc-

ceeding blows of the condensing appliance. This will insure that no uncondensed areas in the gold remain, resulting in the attainment of maximum density, and we shall have used the resiliency of the dentin to advantage in that the frictional resistance so created will prevent loss of the restoration, and, through perfect adaptation, the cavity will be perfectly sealed.

After the foregoing procedure, a concavity of the surface of the mass of gold will probably be developed. This is to be desired as it will mean that the margins of the gold will reach the beginning of the bevel of the cavosurface angle in advance of the main body of the gold and this, in turn, will make it possible to lap the margins of the cavity ahead of the body of the filling, thus helping to insure sealing of the cavity. If this is disregarded, it will be found, on completion of the restoration, that addition of gold to the margins will be necessary. It will soon become evident that this cannot be easily accomplished with satisfaction. The mistake should not be made of attempting to cover all margins of the cavity too far in advance of the main part of the restoration. Such a procedure would be illogical.

If the restoration involves a contact point, a special effort should be made to secure the best possible condensation in this area, to prevent too rapid wearing at this point. Again let me emphasize the advisability of securing separation of the teeth in making restorations wherein the contact is involved. The necessity for this can now be appreciated.

The necessity for careful attention to contour in finishing gold foil restorations has been previously mentioned. It must be remembered that one of the principal objections to gold foil is its color. Also, it must be remembered that this objection can be minimized. Close observation of surface contour, including line angles, and necessary modifications of them will help to create a better impression of gold foil restorations. A high polish is not necessarily essential to gold foil restorations. In fact, they will, in many cases, be less conspicuous without a polish, but smooth surfaces are necessary to cleanliness and prevention of recurrent decay.

CONCLUSION

This presentation must not be regarded as so comprehensive as to require no additional study of gold foil as a permanent restorative material, if the operator expects to use this material with satisfaction. Experience is necessary to correct manipulative procedures. Realizing that this paper contains no new information about gold foil, I have offered it with the expectation that it will help to stimulate the use of foil by those who, in the past, have neglected to give it the consideration which it deserves. Many discriminating members of our profession are using gold foil. They are sincerely trying to give their patients the best service of which they are capable. We should manifest our interest in and satisfaction with foil, not only by using it ourselves, but also by encouraging others in its use. Finally, let us urge our patients to accept gold foil when it is indicated, in place of other materials of a less permanent nature.

DENTURE RECOVERED FROM STOMACH AFTER THREE YEARS

By David F. Heron, D.D.S., Detroit, Mich.

THE psychopathic patient who swallows incredible quantities of foreign objects, including nails, hair, knife blades and bits of broken glass, is now a familiar figure in the medical literature. Often, he survives operation only to repeat the performance. Children and professional jugglers sometimes get into similar difficulties. Less common are the normal adults who accidentally swallow large objects, and rare is the person who is totally unaware of the situation over a long period of time. In the case reported here, a normal person swallowed half of an artificial lower denture, was unaware of having done so and was relatively symptomless for a period of three years, after which the denture was removed by gastrotomy and the patient recovered.

REPORT OF CASE

A man, aged 54, first seen at the hospital, December 4, 1939, complained of sharp pain in the right lower abdominal quadrant, vomiting, anorexia and loss of weight over a period of three weeks. There was no rigidity of the abdomen and no masses were palpable. Roentgenographic examination of the gastro-intestinal tract revealed an opaque shadow 5.5 by 1.5 cm. in diameter in the vicinity of the stomach, having the appearance of a large portion of an artificial denture. Additional roentgenograms showed the foreign body to be loose within the stomach, moving about with peristalsis. Upon close questioning, the patient recalled that, three years previously, he had dropped his lower denture, breaking it into two pieces. He had picked up the pieces, fitted them together and replaced the denture in his mouth. Sometime later he noticed that a half portion was missing, but it did not occur to him that he might have swallowed it. He remained in good health for two years, when a right herniorrhaphy was performed at another hospital. No other abnormalities were noted at that time and the patient had remained in fair health until his present illness. December 15, a gastrotomy and an appendectomy were performed by Dr. Alexander W. Blain. Removal by gastroscope was considered, but, in view of the accompanying appendicitis, it was deemed safest to remove the foreign body by abdominal incision. The denture, when recovered, was found to be coated with a hard, smooth, jet-black substance. All jagged and sharp edges had been rounded off by this coating and crevices filled in. The teeth and the denture base were equally well coated. January 11, 1940, the patient was discharged, having recovered from the former symptoms.

DISCUSSION

This case has several interesting aspects. First is the length of time that the patient was able to carry a foreign body of this size in his stomach and be free from pain. Even the pain that eventually brought him to the hospital was in all probability caused by an infection of the appendix. Second is the peculiar ebony-like coating found on the denture. Whether this was an attempt on the part of the body to cover the sharp edges by a method such as is used by the oyster in forming a pearl or merely a result of the action of hydrochloric acid on the vulcanite of the denture-base is speculative. Cases in

*From the Department of Oral Surgery, Alexander Blain Hospital.

which metallic objects remaining in the stomach for some time have exhibited erosion have been reported, but I find no other case in which a foreign body was similarly coated.

One effect of the presence of foreign bodies in the stomach for a long time is an increase in friability of the gastric wall, rendering operation difficult. The presence of foreign bodies in the stomach usually causes death ultimately. If they are small and few, they may be passed spontaneously. Thorek[1] points out that the stomach is extraordinarily tolerant of the presence of foreign bodies, citing cases from the literature in which insane patients have ingested large quantities of

Roentgenogram of gastrointestinal tract showing portion of artificial denture in vicinity of stomach. The outline of the teeth is plainly visible on the original film.

pins, nails and broken glass without perforation of the stomach wall. Hoisholt (cited by Thorek[1]) reports the passing of twenty-three pieces of glass, some more than an inch in length, through the intestine of an insane woman, apparently without injury. He observes that the passing of small objects is common only among the insane and professional jugglers. It is among the former group that great numbers of foreign objects are recovered at operation or necropsy. Chaik and Foucar[2] reported a classic case in which 2,533 foreign objects, including pins, needles, glass, wire, coins and washers, were removed from the stomach of an insane woman 42 years old. There was little evidence of injury to the gastro-intestinal tract. The entire mass weighed 410 gm. Swain,[2] in 1895, removed a hairball weighing 5 pounds. Curl and Culver,[2] in 1922, found a mass of carpet tacks and miscellaneous objects weighing 907 gm. This patient made an uneventful recovery. Recently, Wheeler[3] performed three gastrotomies on one patient, the largest number so far recorded, over a period of six years, in which a total of 1,300 foreign objects were recovered.

Chalk and Foucar, Curl and Culver, Gaylord and Wardell are among the few reporting recovery of the patient following the removal of such large or heavy masses of foreign bodies. In Wardell's[2] patient, a 16-year-old girl, 2¼ pounds (1,020 gm.) of 1¼-inch nails was removed from the stomach. These had been swallowed over a period of nine years. Friedenwald and Rosenthal,[1] in 1903, were able to collect ninety cases in which foreign bodies had remained in the stomach for considerable periods of time. Among these, Schwabe,[1] in 1635, is stated to have removed a table knife from the stomach of a professional juggler forty-one days after its ingestion. In 1878, Kaiser[1] removed a knife which had remained in the stomach fifty-one days. The patient recovered. Balfour[1] removed seven teaspoons from the stomach of an insane patient. In Caven and Weir's[1] patient, a knife, fork and spoon were found in the stomach.

Instances have been reported in the dental literature of aspiration of teeth and dentures into the lungs, bronchi and esophagus. Bettenhausen's[4] 80-year-old patient swallowed a mandibular denture, which lodged in the esophagus. He died at operation. Wilson's[5] case, in which an artificial denture lodged in the descending colon, also terminated fatally. In one of the earliest cases at Massa-

chusetts General Hospital,[6] a normal patient who had inadvertently swallowed an artificial denture was operated on. There has been no record, as far as I was able to ascertain, of a bulky denture having been swallowed with no ill effects, or of one having entered or been retained in the stomach.

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2201 Jefferson Avenue East.

ACCIDENTAL SYPHILITIC INFECTION OF DENTISTS: REPORT OF TWO CASES

By WILLIAM LEIFER, M.D., New York, N. Y.

THE incidence of innocently acquired syphilis in dentists is probably not very high. In 1903, Baldwin[1] wrote a monograph directing the attention of the dental profession to the prevalence of infectious syphilitic lesions on the lips and in the mouth. He warned that "infection through the fingers is by far the most frequent mode of inoculation among physicians and dentists." Since these words were written, *Treponema pallidum* has been discovered; serologic testing of the blood has been improved and has become almost routine practice, and truly specific and highly successful therapy has been developed. Nevertheless, accidental infection still occurs among dentists, and it is surprising that it does not occur more often. Most dentists work without rubber gloves, their fingers exposed to highly infectious primary and secondary syphilitic lesions.

The majority of extragenital chancres appear on the lips, and a not inconsiderable number within the mouth. In a series of sixty-eight such cases, reported by Wile and Holman,[2] thirty-nine (57 per cent) were on the lips, ten (14 per cent) on the tonsil, five (7 per cent) on the tongue and two (3 per cent) in the pharynx. In a series of thirty-eight extragenital primary lesions reported by Downing,[3] twenty-eight (73.6 per cent) occurred on the lip and two (5.3 per cent) on the tonsil. Of sixty-five cases reported by Tobias,[4] thirty-six (55 per cent) were on the lip, one (2 per cent) on the tonsil and six (9 per cent) on the tongue. On the whole, primary syphilis about the lips and mouth is infrequent as compared with primary syphilis of the genitals. However, during the secondary stage of the disease, there occur a high percentage of infectious lesions of the lips, mouth and throat. These are perhaps even more dangerous because of the relative innocuousness of their appearance.

The present report is prompted by the

observation of two patients, both young dentists, who innocently acquired primary syphilis of the finger.

REPORT OF CASES

CASE 1.—A dentist, under 30 years of age, developed an infection in the nail fold of the left index finger. A Wassermann test of the blood six months previously had been negative.

The digital infection, diagnosed as paronychia, was followed by enlargement of the left epitrochlear and axillary lymph nodes. The nail matrix was incised, but no pus was obtained. Subsequently, there was a purulent discharge from the primary lesion, and the epitrochlear lymph node became more enlarged, extremely tender and fluctuant. The node was thereupon incised and a considerable amount of thin purulent material evacuated.

Despite treatment, neither the finger nor the lymph nodes showed any tendency to heal. About two months after the appearance of the digital lesion, a generalized skin eruption developed, and, for the first time, suspicion was aroused. A dark-field examination of the pus draining from the epitrochlear lymph node revealed *Treponema pallidum* in great numbers. A Wassermann test of the blood was strongly positive.

The patient was seen by me at this time. He presented a moderate swelling and discoloration of the terminal phalanx of the left index finger, with some purulent discharge under the nail. The left epitrochlear lymph nodes were enlarged, and there was considerable periadenitis, with redness, swelling and tenderness. Over the nodes, there was a partially healed incision, from which exuded a thin purulent material. The left axillary lymph nodes were firm and not particularly tender. Leading away from the axillary lymph nodes was an enlarged "pipestem" lymphatic vessel. The throat was diffusely reddened, and on the body there was a sparse maculopapular eruption. The Wassermann reaction of the blood was four plus.

CASE 2.—A dentist, under 30 years of age, developed an abraded area in the nail fold of the left index finger. The lesion, which gradually enlarged, became painful and tender, and finally moist and crusted. About one week after onset, the lymph nodes in the left axilla became enlarged and also painful and tender. Somewhat later, a left epitrochlear lymphadenopathy developed.

About two weeks after onset of the lesion, a physician was consulted and he suspected that it might be syphilitic. A dark-field examination was promptly made, and revealed the presence of *Treponema pallidum*. The Wassermann reaction of the blood was four plus.

Both patients received massive-dose arsenotherapy[5, 6] by the drip method (the so-called five-day treatment of syphilis). They took this treatment without difficulty or reaction, and the serologic test has become negative. Their progress is excellent, and on the basis of past experience, they may be considered cured.

COMMENT

It is apparent that efforts to train the general practitioner of dentistry in the recognition of syphilitic lesions about the mouth must fall somewhat short of the desired goal. Especially is this true when two young dentists, fresh from their educational courses, develop primary syphilis of the finger.

The mouth and lips are the sites of many different types of eruptions. Lesions occur here as a result of bacterial and fungous infections, avitaminosis and infection with Vincent's organisms; as manifestations of certain systemic diseases; from sensitivity to drugs, and owing to the presence of ill-fitting dental plates. The use of mouthwashes and toothpastes may have reactions. "Cold sores," lichen planus, leukoplakia and other local lesions are not uncommon. The differentiation of these lesions from syphilitic ones may be simple for the trained dermatologist, but even he at times will be confronted with a diagnostic problem of great difficulty.

It seems to me to be asking too much to require the general practitioner of dentistry to become a trained dermatologist in order to make a diagnosis of the various lesions which he may en-

counter. It would be desirable, however, to require that, before inserting his hands in any mouth, the dentist make a thorough inspection of the lips and the accessible mucous membrane of the buccal cavity and pharynx, using a strong light and a mirror or tongue blade. If he notes any abnormality which he cannot recognize as of dental origin, he may proceed in one of two ways. He should not tell the patient that he has syphilis, or even suggest it, but rather apprise him of the fact that a certain condition exists which requires a medical opinion. The practitioner may then go no further with the dental treatment until the medical consultation has been obtained, and he is assured of the innocuousness of the lesion. Or he may carry out whatever emergency procedure is needed, wearing gloves to protect himself.

The occurrence of the primary lesion on the left index finger in both cases reported is not due to chance, but is the result of the usual technic practiced by dentists. The right-handed dentist holds his working instrument in the right hand, while he pushes aside the cheek by inserting his left index finger against the buccal mucosa. It would follow, therefore, that most, but probably not all, digital chancres in dentists would occur on this finger.

Early diagnosis of syphilis and prompt institution of therapy assure a better outlook for cure. In one case, the diagnosis was established within two weeks of the appearance of the digital chancre. In the second, nine weeks elapsed before the diagnosis was made. The possibility of infecting other patients, as well as members of the immediate family, must always be borne in mind. As Fournier[7] has said, "To diagnose an extragenital chancre is simple, to keep it in mind is difficult." Paronychia in dentists must always be looked upon with suspicion, and the possibility of syphilis be kept in mind.

SUMMARY

1. In two cases of digital chancre of the left index finger in dentists, one case was overlooked for a period of nine weeks from its inception. Both cases were originally diagnosed as paronychia.

2. Both patients received massive-dose arsenotherapy by the drip method, with apparent cure.

3. A plea is made that dentists make a thorough examination before they begin intra-oral manipulations, and that they assure themselves with medical and laboratory aid that lesions present are not syphilitic.

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180 East Seventy-Ninth Street.

PRELIMINARY STUDIES ON CARIES IMMUNITY IN THE DEAF SMITH COUNTY (TEXAS) AREA

By EDWARD TAYLOR,* D.D.S., Austin, Texas

WE believe that a formula can be devised which will assure a high degree of immunity to caries by the proper combination of fluorides, phosphorus, calcium, vitamin D and possibly other factors in the food and water intake.

This report, which is to be only partial and preliminary, will endeavor to show that the studies begun warrant continuation on a larger and more exhaustive scale. It should be borne in mind that while much of the previous study on the etiology of dental caries has been made on guinea-pigs, monkeys and other animals and foreign and isolated tribes of people, these studies are being made on average normal American people living under the average circumstances of American life.

More or less accidentally, and through the advice of one of the two dentists in Hereford, Texas, an area in and around Hereford and Deaf Smith County, Texas, was found to have an extremely low incidence of dental caries among the native born, continuous residents, and it was found further that this immunity extended in a high degree to foreign residents of the area.

Upon a superficial cross-section examination, of fifty-six people chosen at random from homes in Hereford and rural areas for several miles in two directions, forty-three were found to be native-born continuous residents. These homes were selected by a teacher and an NYA worker who knew nothing of the dental conditions of the residents. Not one carious tooth or filling (DMF)[1] was found in the dentition of the forty-three native people, ranging in age from 2 years to past middle age.

With the beginning of the school term in September 1939, a full-time public health dentist was assigned to the area for the purpose of conducting a survey to delimit the area involved. As a preliminary measure, and for the sake of comparison with an East Texas County situation in which this dentist has spent two years making tongue blade examinations, a survey was made of the school children of Hereford, approximately 810, in which was found a 0.48 DMF[1] per child in the native-born continuous resident.[2]

Tongue blade examinations were also made on the school children of Canyon, Randall County, Texas, 30 miles northeast of Hereford. Approximately 900 children were examined. It was found from general observation that of the rural children brought to the Canyon schools, those from the west, toward Hereford, presented dental conditions very similar to those found in the Hereford children, while those from the east of Canyon showed a much higher incidence of caries, though less than elsewhere.

*Director of Dental Health, Texas State Department of Health.

Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Eighty-Third Annual Meeting of the American Dental Association, Houston, Texas, October 30, 1941.

1. DMF: Decayed, missing or filled.

2. A continuous resident is one born in the community and reared there with not more than thirty days' interruption.

DESCRIPTION OF THE COUNTRY

Hereford and Deaf Smith County, which are in a level high plains country, have a uniform typical water supply for both urban and rural districts. The top soil, a dark sandy loam about 12 to 18 inches in depth, is underlaid with a clay known as caliche, which, we are reliably informed, is very high in assimilable calcium carbonate ($CaCO_3$ 71 to 88 per cent) according to the Texas State Highway Department laboratory. It immediately occurred to us that from this soil impregnated with calcium, the plant life might be assimilating calcium in a high percentage. We noted that wheat and potatoes were widely cultivated in this area. The county agricultural agent informed us that the two large flour mills at Hereford boasted an extremely high protein content of the native flour. Analysis of the flour of these mills in the state laboratories at Austin revealed a phosphorus content nearly six times as high as that of the average standard flour.

TABLE 1.—ANALYSIS OF HEREFORD AND STANDARD FLOUR

	Hereford Flour Per Cent	Standard Flour* Per Cent
Ash at 900° C.	0.413	0.42
Calcium (as Ca)	0.274	0.037
Phosphorus (as P_2O_5)	0.199	0.037

*Winton: Structure and Composition of Foods, Vol. 1.

TABLE 2.—MILK ANALYSES

	Cream O'Plains Dairy Per Cent	Prairie Dairy Per Cent	Leach Standard Per Cent
Ash	0.71	0.72	0.71
Calcium (as CaO)	0.16	0.16	0.14
Phosphorus (as P_2O_5)	0.22	0.24	0.17

Analyses of two samples of mixed whole milk from two local creameries revealed 30 per cent more phosphorus than required by the Leach standard for milk. This indicated that possibly all vegetables and dairy and meat products of the area are comparably high in these elements so necessary to building and maintaining tooth tissues.

WATER SUPPLY

The water supply for the rural and urban districts is from the same stratum and approximate depth—from 70 to 80 feet. Every rural home and many of the urban homes have one or more windmill wells from which truck and garden products are irrigated, this being a semi-arid country. Hereford has been known as the "City of Windmills" and as the "Garden Spot of the Panhandle."

TABLE 3.—DECAYED, MISSING AND FILLED TEETH IN ELEMENTARY AND HIGH SCHOOL CONTINUOUS RESIDENTS, DEAF SMITH COUNTY

Number of children	289
Number with DMF teeth	111 (38.4%)
Number of DMF teeth	356
DMF teeth per child	1.23

TABLE 4.—DECAYED, MISSING AND FILLED TEETH IN ELEMENTARY SCHOOL CHILDREN, DEAF SMITH COUNTY

Whole group	540
DMF teeth per child	1.47
Continuous residence	189
Number with DMF teeth	62
DMF teeth per child	1.05
Non-continuous residence	351
DMF teeth per child	1.69

These waters contain, according to the several analyses of the Texas State Laboratories, from 2.2 to 2.7 parts per million of fluoride. The calcium of these waters is 45 parts per million and the pH ranged from 7.5 to 7.7.

PECULIARITIES

It was apparent that the people there grow an exceptionally high percentage of their foods. With their irrigation and their new soil, a large variety of vegetables and truck products are grown and over a longer period of the year than where irrigation is absent.

Most of the homes produce adequate dairy products, poultry products and meats and their tables are supplied to a great extent by home-grown foods.

The racial stock is comparable to that of the average for America, being composed of German, Irish, Scotch and a blending of the three.

APPEARANCE AND STRUCTURE OF THE TEETH

The native-born continuous residents present the almost universally typical teeth of that area; that is, they have mild to very mild mottled enamel, usually of the white chalky variety. A very few have light yellow or light brown mottling. A very small percentage have what would be classified as moderate mottling, and they usually have spent some time in other sections. For the most part, the anterior teeth are short, square, blocklike and strong in appearance and the posterior teeth likewise are short and blocky, with low flat cusps and shallow pits and grooves, many times to the extent of having no pits and grooves whatever. There is noticeable evidence of wear or abrasion (attrition) on the chewing surfaces of both the anterior and the posterior teeth. People reared in eastern and northern states were easily identified by their long tapering teeth, with high cusps and deep grooves, in contrast to the teeth of the native people.

In corroboration of the emphatic statement of the local dentist, it was further observed that people with the usual number of cavities and fillings moving there from other localities after living there a few months ceased to develop caries, and, after as long as five years, a few areas of active caries had ceased to be active and the cavities had acquired hard, glazed floors and surfaces. There is almost a total absence of interproximal caries, especially in the anterior teeth.

With this significant information, the Texas State Department of Health agreed to collaborate and assist with all of its facilities in continuing the studies on a more reliable basis and under methods comparable with those used by Dean, Jay and others in four cities of Illinois: Quincy, Galesburg, Monmouth and Macomb.[3]

TABLE 5.—DECAYED, MISSING AND FILLED TEETH IN 12, 13 AND 14 YEAR OLD CONTINUOUS RESIDENTS, DEAF SMITH COUNTY

Number of children	54
Number with DMF teeth	21
Number of DMF teeth	55
DMF teeth per child	1.01

TABLE 6.—DECAYED, MISSING AND FILLED TEETH IN 12, 13 AND 14 YEAR OLD FIVE-YEAR RESIDENTS, DEAF SMITH COUNTY

Number of children	76
Number with DMF teeth	27
Number of DMF teeth	78
DMF teeth per child	1.02

TABLE 7.—DECAYED, MISSING AND FILLED TEETH IN ELEMENTARY AND HIGH SCHOOL CONTINUOUS RESIDENTS, RANDALL COUNTY

Number of children	129
Number with DMF teeth	68 (52.7%)
Number of DMF teeth	203
DMF teeth per child	1.57

TABLE 8.—DECAYED, MISSING AND FILLED TEETH IN ELEMENTARY AND HIGH SCHOOL CONTINUOUS RESIDENTS, CORYELL COUNTY

Number of children	113
Number with DMF teeth	61 (53.9%)
Number of DMF teeth	191
DMF teeth per child	1.69

TABLE 9.—DECAYED, MISSING AND FILLED TEETH IN ELEMENTARY AND HIGH SCHOOL, CONTINUOUS RESIDENTS, GARZA COUNTY

Number of children	157
Number with DMF teeth	110
Number of DMF teeth	382
DMF teeth per child	2.42

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TECHNIC

The forms used in the Illinois studies were adopted with slight modifications and additions, as follows: Birth place? Has person lived here continuously? If not, how long has person lived here continuously? Classification of cusps (0-none; 1-low; 2-medium; 3-high).

Examinations were made in an adjustable chair, with standard mouth mirror and sharp explorers, under adequate natural and artificial light. Examinations of all children enrolled were made in an unbiased and painstaking manner and the charting was so conducted that the examining dentist had no knowledge of the residence of the subjects. All charts are sent to the central office of the state department of health of Austin for tabulation by the punch card method.

Children of all public school ages, from 6 to 18 years, were included, and both deciduous and permanent teeth were considered.

Since no studies have yet been conducted with these methods and technics in other non-fluoride areas with different soil, water and environment for controls and comparison, we were forced to use common knowledge of the incidence of caries as our control in these studies for the present. The average seems to be from 5 to 10+ DMF per child.

With the mirror and explorer examinations in the Hereford schools, the DMF per child was raised from 0.48 to 1.05 among the native-born, continuous-resident children, which was approximately double the findings of the tongue blade examinations. This incidence is approximately one-half as high as that found by Dean, Jay and others in Galesburg, where the fluorine content of the water was 1.9 parts per million, and comparable with that of Deaf Smith County. Thus Galesburg, as far as we know, shows the lowest caries incidence heretofore reported in the United States.

TABLE 10.—COMPARATIVE DATA ON CARIES IMMUNITY IN CONTINUOUS RESIDENT ELEMENTARY AND HIGH SCHOOL PUPILS

County	Number of Children	Number with DMF Teeth	Number of DMF Teeth	DMF Teeth per Child
Deaf Smith				
Elementary and high school	289	111 (38.4%)	356	1.23
Elementary school	189	62 (32.8%)	200	1.05
Randall				
Elementary and high school	129	68 (52.7%)	203	1.57
Coryell (Gatesville)				
Elementary and high school	249	145 (58%)	459	1.95
Garza (Post)				
Elementary and high school	157	110 (70%)	382	2.42

TABLE 11.—DMF RATE ON BASIS OF MOTTLING SEVERITY (113 GATESVILLE CHILDREN)

Normal		Questionable		Very Mild		Mild	
No. Children	DMF Rate	No. Children	DMF Rate	No. Children	DMF Rate	No. Children	DMF Rate
18	2.37	13	1.6	31	0.66	45	1.43

CLINICAL FINDINGS

In Deaf Smith County (Hereford), of the 810 children examined, 289, who were native born continuous residents, presented teeth as shown in Table 3.

In the Hereford schools, there were fifty-four continuous resident children 12, 13 and 14 years of age, which made

an age level sample comparable with that used in the studies in Illinois. Of the fifty-four, twenty-one had one or more DMF teeth, with an average of 1.01 DMF teeth per child. Let us note here that, as in all groups in this area, a very small percentage of the children had any DMF teeth. These two figures are found in Table 5.

Of the 12, 13 and 14 year old group in the Hereford schools who had lived in Deaf Smith County as long as five years, there were seventy-six, twenty-seven of whom had one or more DMF teeth, a total of 78 DMF teeth, giving 1.02 DMF teeth per child, as shown in Table 6.

In Randall County, adjoining Deaf Smith County to the east, which is generally represented by the Canyon school children, who are brought in from all over the county by buses, of the 129 continuous resident children, sixty-eight had one or more DMF teeth, or 52.7 per cent. This is a considerably higher percentage than in Deaf Smith County. In the sixty-eight children, 203 DMF teeth were found, which gave 1.57 DMF teeth per child, again a considerably higher percentage than in Deaf Smith County. (Table 7.)

In the 249 continuous residence children of Gatesville examined where the water contains 2.5 parts per million of fluorine, 58 per cent had 495 DMF teeth, or 1.95 per child. (Table 8.) This indicates that since even, in Coryell County, the incidence is much lower than the average in non-fluorine areas, fluorine is an important factor in the immunity; but since the incidence is higher in Gatesville than in Deaf Smith County, we are led to believe that there are other factors involved.

Post, Garza County, was chosen for the next survey. Here, the municipal water supply contains from 6+ to 8 parts per million of fluorine. Post, a town of slightly more than 2,000, is located at the base of the Panhandle in the plains country. The same dentist was employed, and the same technic used. In the 157 continuous residence children examined, the caries experience rate was 2.42 DMF teeth per child, which is two and a half times the rate at Hereford. It will be remembered that the fluoride content at Post is also about three times as great as at Hereford. This seems to indicate that an extremely high fluoride content in some way interferes with enamel calcification, with a resulting weakened resistance.

It was noted that the caries at Post was of different appearance from that in

TABLE 12.—L. ACIDOPHILUS COUNTS IN PRESENCE OF FOUR OR LESS CAVITIES

Cavities per Patient	L. Acidophilus Count Average*	Total Place Count Average
0	1,779	11,543,700
1	10,464	7,798,545
2	19,377	6,716,000
3	30,297	4,876,000
4	32,348	6,240,000

*All figures based on bacterial cells per cubic centimeter.

TABLE 13.—COMPARISON OF CALCIUM AND PHOSPHORUS CONTENT OF HEREFORD FOOD PRODUCTS AND CONTENT AVERAGES INDICATED IN VARIOUS TEXTS

Food	Hereford Sample	Laboratory Handbook	McCanne Text	Rose Text
Carrots				
Calcium	0.0438	0.046	0.048	0.046
Phosphorus	0.067	0.04	0.021	0.041
Turnip greens				
Calcium	0.273	0.346		
Phosphorus	0.0658	0.049		
Green beans				
Calcium	0.0481	0.055	0.033	
Phosphorus	0.0576	0.05	0.026	
Cabbage				
Calcium	0.0768	0.046		0.045
Phosphorus	0.0539	0.034		0.034
Lettuce		Sherman Text		
Calcium	1.043	0.054		
Phosphorus	0.499	0.031		

non-fluoride areas. It was difficult to determine in most cases whether it was active caries or a *progressive fluoridic hypoplasia*. The tooth tissue is of a dark, leathery texture and appearance. Eventually, however, the pulp is exposed and destroyed. The initial progress seems to take place more from within the tooth in many cases. Children from east of Post, where the well water is so highly mineral that cistern water has to be used, show a much higher caries incidence than those using the city water and those living west of town and on the cap rock. (Table 9.)

Table 10 compares the incidence of caries in Deaf Smith, Randall, Coryell and Garza Counties. The DMF teeth per child is lowest in Deaf Smith County, a little higher in Randall (owing to the large number of children from the eastern part of Randall County who showed a considerably higher incidence of caries) and still higher in Coryell County, where the fluoride in the communal water supply of Gatesville is comparable to that in the water supply of Deaf Smith County. Coryell County is in the central part of the state. Only Gatesville continuous resident children were considered, since the waters of the county vary and the contents are not definitely known. The same dentist was employed, and the same technic used, as in Deaf Smith and Randall counties.

It is apparent that, in Deaf Smith County, the incidence of caries is directly proportionate to the degree of mottling, beginning with the lowest incidence of caries in the normal classification and gradually rising as the severity of mottling increases; whereas, in Coryell County, almost the reverse is the case, the normal having 2.37 DMF teeth per child, questionable, 1.6; very mild, 0.66, and mild, 1.43. Perhaps the explanation of this is that, in Deaf Smith County, even the normal teeth of continuous resident children could not have escaped the influence of the fluoride content to some degree, and the children had had more nearly the desired amount. (Table 11.)

BACTERIOLOGY

Simultaneously with the studies in Deaf Smith County, bacteriologic studies of the saliva were instituted. The technic used by the Texas State Laboratories was a slight modification of that used at Ann Arbor, with a view to coordinating the *L. acidophilus* count with caries. After considerable experimenting, it had presented little significance. Finally, groups of children were selected for *L. acidophilus* counts as follows: no active cavities; one active cavity; two cavities; three cavities, and four or more active cavities. Table 12 reveals that the *L. acidophilus* count rose at the rate of approximately 10,000 per cavity from zero up to three active cavities; and about 2,000 for the additional fourth cavity. Children with more than four active cavities could not be found.

CHEMISTRY OF DEAF SMITH COUNTY FOODS

In pursuance of the indication that there is a high phosphorus content in Deaf Smith County soil, and possibly a high calcium content, vegetables and foods common to that area are being analyzed for phosphorus and calcium and will later be analyzed for fluorides and vitamins. Through the cooperation of the Texas Technological College at Lubbock and the University of Texas, samples of the following foods have been analyzed: carrots, turnip greens, green beans, cabbage and lettuce. In every instance, the phosphorus is higher than the average; in some instances, from two to three times as high. Analyses of meats were reported to show a very much higher phosphorus and calcium content than the standards for corresponding meats. Further studies of meats should be made before this comparison can be considered adequate and reliable.

Table 13 shows the comparison. The

averages for calcium and phosphorus were secured from "The Laboratory Handbook of the Home Economics Department of the University of Texas," an English handbook by McCanne and an American handbook by Mary Swartz Rose. Studies of the foods and water of this area will be continued and they will be compared with the foods and waters of the areas included in the studies.

FUTURE PLANS

Continuation of the studies at several other points in the state is planned, using Gatesville in the central part, where the water contains an equal amount of fluorine to that found in Deaf Smith County; Post (Garza County) in the northwest where the fluoride content is approximately 6 parts per million; a county to be selected in the plains area similar in the general characteristics to Deaf Smith County, but having no fluorides in the waters, and at least one county in far eastern Texas showing no fluorides and where the general characteristics are very different from those of Deaf Smith County.

The present findings would indicate that there is a desirable level of fluorides in combination with other factors which results in the highest immunity to caries; and it is apparent that the desirable level is in the neighborhood of 2 parts per million of fluorine.

It is, perhaps, logical to consider magnesium as a possible factor. Certainly, the calcium : magnesium ratio is not to be disregarded in the field of metabolism. It has been pointed out that hypoplastic enamel is produced in animals by a magnesium-deficient diet. Records of Texas State Laboratories reveal that whereas the average magnesium in the waters of the state is approximately 10 to 15 parts per million, at Hereford it is 67. This leads us to believe that the magnesium content of the water should be investigated with regard to caries immunity. Only one other county records a higher magnesium content, Cottle County. Nothing is yet known of the comparative caries rate there, but it will be studied soon.

Recently, collaboration with the Baylor University College of Dentistry has been initiated. It is believed that interesting reports will be forthcoming as a result.

TENTATIVE CONCLUSIONS SUMMARIZED

1. The incidence of caries in the Deaf Smith County area is approximately half as high as the lowest heretofore reported in the United States and much lower than the average.

2. The incidence of caries in the native-born continuous residents of Deaf Smith County is much lower than that of the whole group.

3. The incidence of caries in the noncontinuous residents who have lived there five years or more of their lifetime, in all counties considered in these studies, is comparatively very low.

4. Caries immunity is at least partially acquired after eruption of the teeth.

5. A combination of conditions rather than a single condition is responsible for the immunity.

6. Either the consumption or the application (washing the teeth), or both, of fluoride is contributory to immunity, but cannot be considered the only factor.

7. There is a desirable median point of concentration of fluorides in communal waters in the neighborhood of 2 parts per million. Ingestion of water containing more than approximately 2 parts per million of fluorine causes extreme fluorosis and decalcification to the extent that caries susceptibility results.

8. There is a comparatively high phosphorus content in the vegetables and animal food products produced in Deaf Smith County.

9. The incidence of dental caries is directly proportionate to the count of *Lactobacillus acidophilus* in the saliva.

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ACCIDENTAL SYPHILITIC INFECTION OF THE DENTIST

FROM time to time over a period of about three decades, it has been our custom to issue editorial injunctions against the more or less careless and indifferent attitude of the average dentist toward the danger of syphilitic infection at the chair, infection of himself as well as the possibility and probability of transferring the infection to his patients and from one patient to another.

In the present issue, a contribution to the subject of syphilitic infection is presented in the form of two case reports involving accidental infection of two young dentists, due, apparently, to an indifferent attitude, possibly supplemented by lack of knowledge of and familiarity with the oral symptoms of syphilis; two young dentists, only a few short years removed from the classroom of dental educational institutions, where the modern conception of asepsis is or should be portrayed in its various implications. Yet these dentists were inoculated with an infectious disease with which they should have been familiar in all its expressions.

It is not at all in any spirit of "I told you so!" that the present in-

junction to watchfulness against this ever-present evil is offered, but in the spirit of appeal to the dentist to be on the alert against the possibility of innocently transferring this dread venereal disease to his patients. Dentistry has arrived at a stage of development of knowledge of the oral manifestations of systemic disease that admits no excuse for failure to recognize these manifestations in the mouth.

The oral cavity is frequently the site of the earliest expressions of syphilis; in fact, it is frequently the location of the lesions of syphilis next evident after its manifestation in the genital organs, and every dentist owes it to himself and to his patients to be sufficiently familiar with the oral symptoms of syphilis to recognize it immediately on visual contact. If such a condition is present and is recognized, every dentist is quite capable of exercising the proper precautions against infecting himself or his patients.

To be sure, it is not necessary or even desirable to require the practitioner of dentistry to become an expert dermatologist in order to be able to diagnose syphilitic and other lesions of the lips and mouth; but it is desirable that the dentist be sufficiently familiar with such lesions to discover, on even casual inspection, the presence of lesions with infectious potentialities. The dentist can then seek medical consultation and carry out any emergency procedure desirable.

The most common symptom of infectious syphilis and one that ordinarily stands out like a red flag to any one working in the mouth is the mucous patch—a lesion that is present in approximately 60 per cent of cases of eruptive syphilis and is readily recognizable by the dentist.

The fact that dentists as a rule observe surgical hygienic precautions in their daily contact with patients probably accounts for the relatively few cases of extragenital chancres acquired in handling these infectious cases. This, however, should not make the dentist careless or neglectful of complete and accurate diagnosis of the disease.

The diagnosis of the hereditary type of syphilis is almost purely a dental problem, as every dentist should be familiar with the classic dental symptom described by Hutchinson, which is almost infallible. It should be remembered, however, that only the second dentition shows the distinctive hutchinsonian stigmata.

Another advantage of early diagnosis is the greater amenability of syphilis to treatment in its early stages. And the dentist, by virtue of his almost constant contact with the oral cavity, can be of inestimable help to the patient and to the medical practitioner in the early recognition of the oral symptoms of syphilis.

The dental practitioner has a threefold interest and responsibility in the effort to control this one disease that preys upon the moral and social fabric of the nation: first, his moral and professional obligation to his clientele; second, his obligation to himself and to those dependent on him, and, third, his moral and professional obligation to avoid transference of this serious disease from one patient to another.

Some one has quite pertinently said that exposure to syphilis is one of the necessary risks of the dental profession, a risk that imposes on the dentist a serious professional health obligation to his clientele.

At this time, the war emergency greatly increases the opportunity of and the responsibility for redoubled efforts on the part of the dental operator to add his share to the efforts to control the spread of this disease which causes such great concern in Army medical circles. As a result of the mobilization efforts necessary in the building of a great army, large groups are being assembled in training camps and concentration areas, military and industrial, and, under such conditions, the disease potentialities of crowded living express themselves in various natural ways. Among the first of the contagious diseases to be seen is syphilis, immediately necessitating inauguration of means of control of the sanitary conditions which influence so definitely the incidence of syphilis. And here it is that the dentist can be of great assistance in the discovery and recognition of the disease in its first manifestations.

To the dental profession is given opportunity of a special character to observe and diagnose syphilitic manifestations in the human mouth, an opportunity which implies and carries with it the obligation to his clientele to safeguard them from infection through the mouth—the obligation to protect himself from infection and the opportunity to aid the medical profession and the public health service in their efforts to eliminate this scourge of humanity.

We cite particularly the circumstances of Dr. Leifer's report of the two cases of infection in the hope that it may increase precautions against transference of this serious infectious disease. And in closing this appeal to alertness in this respect, we can do no better than to emphasize the desirability that every dentist observe the indicated precautions of examination before beginning intra-oral manipulations, and that he assure himself with medical and laboratory aid that lesions present are not syphilitic.

THE DENTAL STUDENTS' REGISTER FOR 1941

THE Dental Students' Register for 1941, prepared by the Council on Dental Education, which we reproduce in this issue of THE JOURNAL, presents some especially interesting and significant figures. The total number of graduates from the thirty-nine dental schools in the United States for the year ending June 30, 1941 was 1,568. This was the smallest class with three exceptions since 1896, when there were 1,432 graduates. The three exceptions were 1906 with 1,519 graduates, 1920 with 906 graduates, and 1930 with 1,561.

The decline in total enrollment which led to this small graduating class began with the depression in 1929 and was accelerated by the widespread adoption of the 2-4 plan about 1935. We have often observed that advanced entrance requirements, or even the lengthening of the period of professional study, do not long deter ambitious American youth. We are not surprised, therefore, to discover from the Register that the curve of enrollment started upward three years ago. The present statistics reveal this situation: with the smallest graduating class in June, 1941 in twelve years, the total enrollment on October 15, 1941 was 8,355, the largest in fifteen years. The increase in October, 1941 over October, 1940 was 635 distributed as follows: 171 Freshmen; 99 Sophomores; 133 Juniors; 232 Seniors.

Marked advance is also shown in the entrance credentials which students now offer. The entering class last fall numbered 2,476. They offered pre-dental training as follows: 2 years of liberal arts, 1,162; three years, 526; four years without a degree, 140; a bachelor's degree, 626; other degrees, 22. What effect the accelerated schedules, which we understand the majority of the dental schools will now undertake, will have upon enrollment and upon the content and quality of pre-dental training can hardly be foreseen. The Council on Dental Education is wisely urging that every effort should be exerted to preserve in the emergency the high standards of pre-dental and professional training already attained.

DENTAL PREPAREDNESS

IN the present issue at page 466 we are publishing an official release from the Committee on Information of the Procurement and Assign-

ment Service. This publication is designed to answer any and all questions which may arise in the minds of the members of the profession regarding the operation of the Procurement and Assignment Service. A careful reading of the plan and scope of this agency will give to every member of the dental profession a clear conception of his part in this all out war effort.

BIBLIOGRAPHICAL

Dental Education in the United States
By JOHN T. O'ROURKE, B.S., D.D.S., Dean and Professor of Oral Medicine, University of Louisville School of Dentistry; and LEROY M. S. MINER, D.M.D., M.D., Sc.D., Dr.P.H., Dean and Professor of Clinical Oral Surgery, Harvard Dental School; Professor of Stomatology, Boston University School of Medicine. With a foreword by RAYMOND A. KENT, B.A., M.A., Ph.D., LL.D., President, University of Louisville. 367 pages. Philadelphia and London: W. B. Saunders Company, 1941. Price $5.

THIS volume, under the joint authorship of two leaders in the field of dental education who have had wide and mature experience as teachers and administrators in their respective institutions, is a unique and valuable contribution to our professional literature. While its greater service may be to those who, like the authors, are engaged in dental professional education, it should command a wide reading by those members of the profession at large who have an active interest in the present status and future development of the processes by which students are prepared to take their place as members of the profession.

The book is an exposition of a new movement in dental education which many of those concerned therewith have recognized as the inevitable result of the implications inherent in a great mass of new scientific fact that has been rapidly accumulating in the comparatively recent past. As an exponent of this new trend, it seeks to promote the utilization of the added knowledge, not merely by the additive process so commonly employed heretofore in professional education, but also through its use to develop a more scientific approach to the whole educative process itself. As Dr. Kent says in the foreword, "The scientific approach to education has the same simple identifying characteristics that it has elsewhere: It is based on an examination of the facts and uses them as the grounds for conclusions," and this the authors seek to do.

As a background for the more specific discussion of the main theme, in the first chapter, the authors trace the evolution of dentistry as a profession in our country and discuss the historical development of dental instruction from the time of the prevalence of the preceptorial system through the hundred year period during which it has been formalized in teaching institutions.

The general aims of dental education are then set forth as they have been advanced by a "growing body of knowledge" and as they have progressively reflected a contantly enlarging conception of the dental needs of the public, from which, in the last analysis, they are derived. Recent and current educational practice is analyzed and some of its shortcomings are discussed. Prominent among these the need of emphasis upon self-education instead of the widely employed meticulous administration of predigested mental pabulum is stressed, not only as being more effective for students of the present day, but also as the means for their acquisition of a method by which they can continue to grow after graduation.

The belief of the authors that the excessive attention given to the training of students for technical proficiency seriously un-

balances the curriculum when space is so much needed for new material will be shared by many teachers. Good, sound instruction in clinical medicine and experience in a general hospital are urged as imperative if students are to be qualified to meet their professional obligations. An enlargement of courses in the basic medical sciences and in orthodontia as an important phase of clinical dentistry and a reduction in the amount of repetitive exercises in both operative and prosthetic clinical practice are recommended. These proposals are indicative of some of the changes which could be advantageously made in the average current dental curriculum in the opinion of the authors.

Their reasoning in this regard as particularly set forth in the chapter entitled: "The need for modification of the dental course" may be briefly stated as follows:

A. The present accumulated newer knowledge has materially outrun current dental practice in general and, with limited exceptions, is not fully reflected in the current curricula of dental schools.

B. Dental education is still too profoundly influenced by the desire to train for technical excellence under the belief that the attainment of skill in reparative procedures continues to be the prime objective of instruction.

C. The bulk of the newer knowledge which must be included in an expanded dental program concerns chiefly the biologic connections and implications of dental service.

D. The utilization of this knowledge can be achieved by such modification of the dental course as will permit the inclusion of the new material in proper amount and perspective without endangering the technical competence of students and without extending the present period of time.

E. These objectives, which are focussed upon the education of a student so that he may become qualified in fact, if not in name, as "an oral specialist in medicine," may be more effectively reached, after the proposed changes are made, by a continuation of dental education as a separate professional program than by its inclusion within conventional medical education. There should however, be a closer integration with the medical program, especially during the preclinical years.

As ancillary to the main theme of professional education, but as having influence upon it in various relations, the succeeding chapters of the book discuss research in dental schools, the value of internships, graduate and postgraduate instruction, licensing procedures and certain public and professional aspects of dental service which have a bearing upon educational policies rather than technic.

This comprehensive treatise may be expected to provoke a keen interest in a very important activity of our profession on the part of a thoughtful reader.

Handbook of Communicable Diseases

By FRANKLIN H. TOP, A.B., M.D., M.P.H., Director, Division of Communicable Diseases and Epidemiology, Herman Kiefer Hospital, and Detroit Department of Health; Associate Professor of Preventive Medicine and Public Health, Wayne University College of Medicine. With seven collaborators. Cloth. 648 pages; 73 illustrations and 10 color plates. Price $7.50. St. Louis: The C. V. Mosby Company. 1941.

THIS new book on the commoner communicable diseases presents a clear, concise account of the epidemiology, pathology, symptoms, diagnosis, prognosis and treatment of this group of infections. Each disease is separately considered in chapter form. Additional chapters on isolation technic in the home and in the hospital and the essentials of nursing care for this group of patients are included to make this volume a complete account of the care and treatment of this special class of patients. Wherever pertinent, several illustrations present typical cutaneous manifestations of the disease under discussion. An interesting appendix of vital statistics collected from the author's own experience and a glossary of terms complete the volume. The book is attractively bound and is printed on paper of good stock.

BOOKS RECEIVED

Man Alive You're Half Dead!

By DANIEL COLIN MUNRO, M.D., Medical Director Lake Placid Club, New York. New York: Bartholomew House, Inc., 1940.

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President's Message

To the Members of the American Dental Association:

NEVER before in the history of the world has it been so necessary for every man, woman and child to put forth every effort to carry to a successful finish those tasks which have been imposed upon us by the war. All must be aroused to a fighting pitch, so that each one of us may willingly put his shoulder to the wheel as he has never done before. Up to the present time, our profession has been 100 per cent cooperative, and I am sure that we will continue to show this spirit until the war is won.

I want to take this opportunity to impress upon you the importance of sending in the first questionnaire which was sent out more than a year ago. We want a record of 100 per cent returns.

May I also call attention to the importance of paying your dues at once. I trust that each member of the American Dental Association will have his dues paid not later than March 1. This would be a wonderful record, and it can be done.

I also want to impress upon you the importance of securing applications for membership from ethical men who are not members of the American Dental Association. I am sure that you know some one who should be a member, and it is your duty to contact him and to see that he becomes a member of this organization.

As another matter of vital importance, we should see that the sophomores, juniors and seniors of the dental schools become junior members of the American Dental Association. Junior membership was created in order that these students might become a part of organized dentistry. It is of vital importance that they join at once so that they may be of help to us, deriving great benefit themselves as well from being affiliated with our organization. It is important that these students join the association during their early training in dental schools so that they may become full members immediately upon graduation.

The matter of Civilian Defense, in which we are all interested, is now being carefully studied by a committee from the American Dental Association. When the plan comes out, I am sure you will be pleased with the place dentistry will occupy in the Civilian Defense of the nation.

Finally, may I urge you to fill in and return at once the questionnaire which you will receive from the Procurement and Assignment

Service within a short time? Do not delay. It is important that you attend to this matter immediately on receipt of the questionnaire.

Last, but not least, please be assured that your suggestions and plans in regard to matters of organized dentistry are welcome. Send your suggestions to the Central Office, 212 East Superior St., Chicago, where they will receive prompt attention at the hands of the proper committee, rather than sending them to other places where they may be misunderstood and fail to receive proper consideration.

Orrin a. Oliver

BUREAU OF PUBLIC RELATIONS

A SUGGESTED PROCEDURE FOR SCHOOL SURVEYS

By Paul A. Topel, B.S.D., D.D.S., Oak Park, Ill.

IT is gratifying to realize that dental examination of school children by community dentists is gaining impetus, and that the procedure is being adopted by more and more towns and cities each year. Much may be written regarding the benefits of such a program, but this treatise will be confined to the actual procedure and mechanics of the examinations.

The first communities to institute school examinations had little or nothing upon which to base procedure. Unforeseen problems arose; perplexing details were encountered, and certain criticisms were forthcoming. State society agencies were of great assistance in many cases, offering solutions and aid, providing charts, etc.

Through experience, much has been learned. Each year has contributed something toward efficiency in conducting the examinations. The following suggestions are based upon the experience and knowledge gained through school surveys in three representative communities in the state of Illinois.

THE EXAMINATION CHART

The first problem, in almost every case, is the selection of a good chart. The examination chart herewith illustrated was evolved after many charts had been tried and found wanting during nine years of work. (Figs. 1 and 2.)

In designing a chart for this purpose, certain salient facts must be borne in mind. First, it should be adapted for a short examination in the great majority of school surveys. A lengthy, cumbersome chart is unwieldy and unnecessary.

The one principal and vital fact that we seek is whether the child is in need of dental attention. We should chart as many essential data as possible, quickly and efficiently, and omit those that are

unnecessary. It is necessary that the chart be simple, easily explainable and quickly understood. It should be possible to do the charting quickly and accurately.

through the eight years of school is desirable. This eliminates the use of pencils of many hues, necessary to indicate the findings of each year when one chart is used.

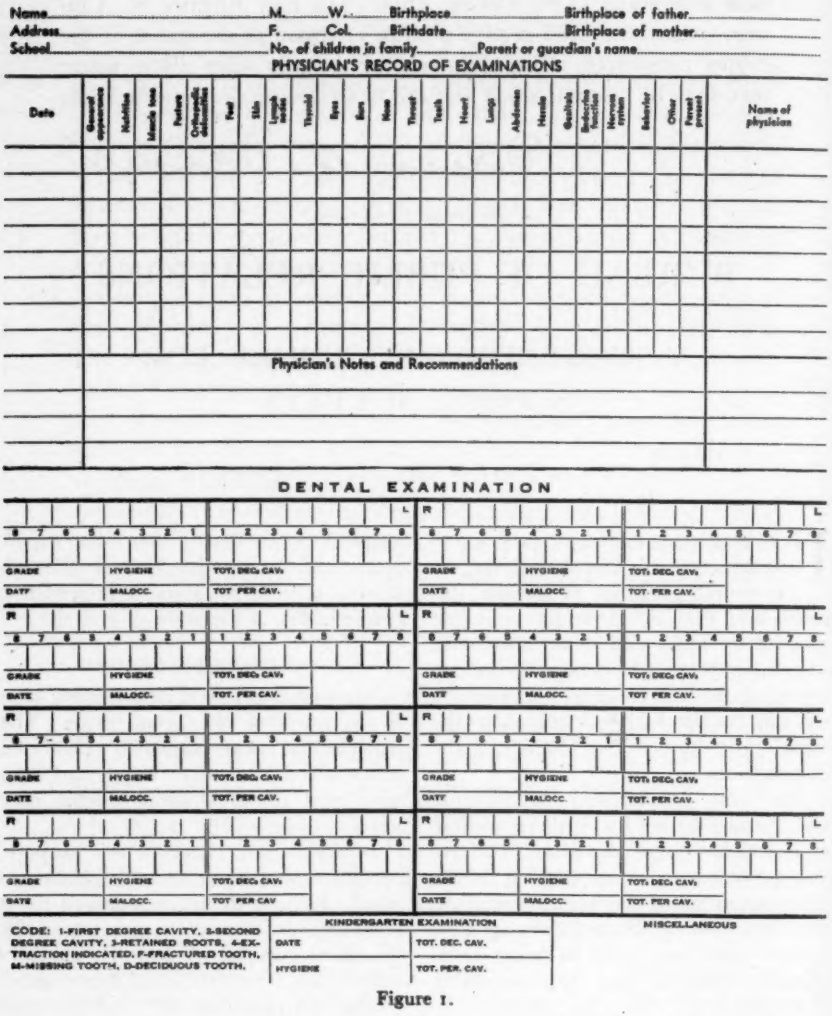

Figure 1.

It is, further, of great assistance to obtain the necessary data from the chart at a glance for purposes of summary and tabulation. It is agreed that a separate chart for each annual examination

Referring to the chart illustrated herewith, it will be noted that all points have been taken into account. It is obvious that eight separate charts for each year and grade are furnished, together with a

simple chart for the kindergarten. The squares above and below the numerals in each chart represent each tooth position and are large enough to accommodate the written tabulation.

It will be noted that the same squares are used for permanent and for deciduous teeth. This feature permits condensation of the chart and rapidity of charting. Spaces for grade and date are furnished; hygiene is marked either good or bad (prophylaxis is necessary, or it is not). If malocclusion is noted, it is

When the examination is in progress, the examiner will call first the tooth position, then the code number or letter; for instance, upper right six —M; lower right five —2; lower left four —D 1; etc. Hearing the tooth position first, the charter carries her pencil to the correct position on the chart very quickly and is ready to write in the code. This single feature speeds up the charting noticeably.

It will be noted that fillings are not recorded. Carious teeth that have been filled will receive no marking on the

Form D-1 — The Tuberculosis Institute of Chicago and Cook County — Sept. 12 29

SCHOOL HEALTH RECORD

Nurse's Record

Diseases / Date	Chickenpox	Diphtheria	German measles	Measles	Mumps	Otitis media	Pertussis	Pneumonia	Poliomyelitis	Scarlet fever	Smallpox
Immunity / Date	Diphtheria Schick Toxoid		Scarlet fever Dick Serum	Smallpox Vaccination		Whooping-cough Serum	Tuberculin test Neg.	Pos.	Active tuberculosis Contact: Who		When

Date of Inspection	Age	Grade	Height in inches	Weight in pounds	Nutrition	Scalp Hair	Skin	Sight R	Sight L	Sight B	Sight with glasses R	Sight with glasses L	Sight with glasses B	Hearing R	Hearing L	Nasal breathing	Throat	Speech	Teeth	Posture	Parent Notified sent	Re-vaccination	Re-Schick	Re-Dick

CODE (X for defect, C for correction, O for no apparent defect; V for irremediable, S for under care)

Figure 2.

merely checked. Spaces for the total number of deciduous and permanent cavities are provided, as well as a blank space for miscellaneous notations. This space may be used to mark an "O.K." in mouths free from decay, to permit quick tabulation.

Referring to the code, it will be noted that the numbers from one to four indicate teeth affected by decay. The letters do not indicate decay. This allows rapid tabulation by merely counting numbers. "D" placed before a number indicates a deciduous tooth.

chart. If a cavity in an upper right first molar was recorded in the first grade, and at the second grade examination received no marking, it is immediately apparent that it has been filled. The chart affords quick comparison from year to year inasmuch as the eight years are included on one card.

SLIPS FOR PARENT

After the child has been examined, he is given one of two slips. If cavities have been discovered; if "hygiene" has been marked "poor" and prophylaxis is ob-

viously necessary, or if malocclusion has been checked, the child is given a slip similar to the following:

To the parent or guardian of_____. A careful examination of your child's teeth indicates a need for dental attention. It is suggested that your family dentist make the necessary corrections as soon as possible.

This slip should be signed by the principal, nurse or school board president. The message does not mention the number or type of defects and indicates no diagnosis. This is done purposely to place the entire case in the hands of the family dentist, to be handled as he sees fit. All controversy is thus checked at its source. Having the slip signed by an authority other than the dentist has proved to be far more discreet.

If the child's teeth are found to be in good condition, he will receive a slip worded:

A careful examination of your child's teeth revealed no defects. They are, at present, in good condition.

In former surveys, it was often the custom to accompany this slip with a "Good Teeth" button, but modern child psychology discourages this practice.

EQUIPMENT AND PROCEDURE

A half-dozen mirrors and explorers, two water tumblers, for the sterilizing solution and for rinse water, and a few clean towels are the only items of equipment basically necessary. The examiner should, of course, wear a clean gown.

The hands are scrubbed thoroughly before the examination is made. If the mirror and explorer are grasped well toward the end of the handles, the fingers need never be close to the mouth and it will not be necessary to wash the hands between examinations. If the fingers enter the child's mouth, they must be washed, but should not be dipped in the sterilizing solution. It is advisable to observe this routine as the examiner is usually under close scrutiny.

A dentist can examine about seventy-five children in a morning without difficulty. In planning a survey, this figure is used as a basis in determining the number required for schools of various enrollments. It is well to have one assistant for each dentist, to do the charting. If a girl is available for the tabulating, she can keep tally as the examination progresses and be ready with the totals when it is finished. If a nurse is also available, she may be assigned to care of the instruments and direction of the children to one or another of the examiners so that no time will be lost in waiting. It is well to explain the whole plan to the principal and teachers since their cooperation is vital.

UNIFORMITY

With the advent of school surveys, and with the inquiries for charts and suggested procedures being made, it is hoped that a standard system will eventually be adopted. It is advisable that a standard chart designed for short examinations be adopted as examiners will acquaint themselves with one and be spared the inconvenience and confusion of working with one and then another. This will also avoid the great amount of work involved in changing record systems.

As public health is a vital issue today, and since school surveys will more and more be forthcoming from members of the profession at large, we have another urgent reason for standardization. If a plan, procedure and necessary materials are immediately available, a community can institute efficient school examinations without confusion, delay and error.

1011 Lake Street.

THE DENTAL PROGRAM OF GRAND FALLS, NEWFOUNDLAND

By ROY D. RIBBLE, D.D.S., New York, N. Y.

AT the end of a professional visit to my office, Mr. F. J. Humphrey, president of the Anglo-Newfoundland Development Company, remarked: "Why can't we do something for the dental care of my people up in Newfoundland?" Thus was born the idea of a program for dental health education for the people of Grand Falls and Bishop Falls, Newfoundland.

Fig. 1.—Hospital dental dispensary.

To travel to Newfoundland during the summer of 1940 necessitated a letter to Washington explaining the motive of the visit, as well as a passport.

The European war was brought home by the "blackout" signs in the Halifax Hotel, as well as the immense concentration of shipping in Halifax Harbor. Leaving North Sydney at night on a vessel without lights, we slipped through the harbor gate on the "all clear" signal from shore to move into the war zone of the dark waters of Cabot Straits.

From Port Aux Basque, a twenty-hour train ride over the single track Newfoundland Government Railroad took us to Glenwood, where a delightful week, spent as the guests of Mr. Robin Reid, gave us all an opportunity to catch up on trout and salmon fishing in a virgin wilderness. My companion had the experience of catching the largest salmon reported from the Gander River for 1940.

The visit to Grand Falls, home of the Anglo-Newfoundland Development Company, enabled me to meet and discuss the dental program with Sir Vincent Jones, general manager of the Anglo-Newfoundland Development Company, as well as the hospital staff, the town manager and the one local dentist.

J. F. Brown, head of the medical staff; W. Gear, the dentist; Miss Le Duew, the community nurse, and L. R. Cooper, town manager at Grand Falls, were all enthusiastic over the idea that some one at last was making an effort to

save the teeth of the children of the community. The average adult being beyond the controllable caries age, we decided that our efforts should be devoted to work on behalf of the 1,800 children in the public schools. This program was carried out through the use of the "Six to Sixteen" and "Jimmy Chew" booklets, introduction of low cost toothbrushes, lectures by the school nurse and *Advertiser* through weekly messages on dental information covering every age group.

A visit the summer of 1941 found continued interest on the part of the community, with plans already formulated for the coming school year.

After the townsfolk have become sufficiently interested, it is our plan to establish a dental clinic as part of the hospital service. In such a clinic, children may be examined and advised and the necessary work performed, in order to establish sound ideas of dental health in the minds and good health in the mouths of these young people.

Fig. 2.—Operating rooms, dental dispensary.

the display of motion picture films loaned by the American Dental Association. To combat such formidable antagonists as ignorance, malnutrition and indifference, a popular health education program was needed for the entire community, and this was initiated by the *Grand Falls*

630 Fifth Avenue.

DENTISTRY IN THE MAGAZINES

A GLANCE through a bulging scrapbook brings to mind the fact that no report has been made recently on "Dentistry in the Magazines." The war, physical fitness and nutritional programs have had a tendency to bring dentistry to the fore, particularly in nutritional articles.

In August 1941, the *Southern Agriculturist* carried W. S. Leather's "Good Food and Good Care Make Good Teeth." In Canada, the autumn number of *Health* featured Harry S. Thomson's "Your Teeth—Front Line of Health Defense." The *Michigan Public Health Journal* published "Development and Structure of Human Teeth," by William R. Davis.

The September *Hygeia* carried the second installment of "From Witch Doctor to Modern Dentist," by Peter J. Brekhus. *Public Health Nursing* published "Dental Health in the Nurse's Visit," prepared by a committee of the New Jersey State Organization for Public Health Nursing. During the same month, the *New Jersey Journal of Pharmacy* published a complete account of New Jersey's State Dental Program, by J. M. Wisan. *The Southern Agriculturist* had an interesting article on "Pyorrhea, Dental Caries and Six-Year Molars," by their health director, W. S. Leathers.

The October *Hygeia* carried the first of another series of articles by Peter J. Brekhus, entitled "Why We Lose Our Teeth," and the *American Professional Pharmacist* published a comprehensive article by Henry M. Burlage, Ph.D., on "Trench Mouth." *The Journal of Health and Physical Education* published Guy S. Millberry's "Dental Health Education," and the *California Parent Teacher* presented a dental health message in a special article on "The Fundamentals of Nutrition."

The November *Hygeia* ran the second installment of the Brekhus' article "Why We Lose Our Teeth." *Life and Health* published Benno E. Lischer's interesting article entitled "Crooked Teeth." During the same month, *The Journal of School Health* published a short editorial on the "Development and Structure of Human Teeth," and *Science News Letter* ran a lengthy article on Hermann Becks' experiments with vitamin B at the Hooper Foundation for Medical Research, University of California. Nutrition was again featured as the *Dairymen's League News* published an interesting article by Martha Smith Fry on "Nutrition and Teeth."

Dental scribes were busy in December. "Merry Christmas for Your Teeth," by C. H. Lerrigo, appeared in the *Ohio Farmer*. "Too Much Candy Makes Teeth Pay the Penalty," by Dr. Lerrigo, was published in both the *Missouri Ruralist* and the *Kansas Farmer*. The Greater New York Dental Meeting was responsible for *This Week* publishing "A Tip from 7,000 Dentists." Irmis Johnson, inspired by the Deaf Smith County dental phenomenon, had a full page in the December 21 *American Weekly*. The *Magazine Digest* picked up the *Time* article on the Deaf Smith County dental story and reprinted it for their readers' attention. The "Cause of Bad Teeth" was discussed by C. G. King in *The Rural New-Yorker*, while Murray Raybin and Bernard M. Leibson discussed "Pyorrhea" in *The Woman*. Konrad Lux had an informative article in the *Texas Outlook* for December, and the relationship of nutrition to dental health was discussed fully by Beulah France, R.N., in the *Capper's Farmer*, in an article entitled "Foods That Build Sturdy Teeth." Lastly, *The California Parent-Teacher* made a strong

plea for a reduction of the sugar intake in an article entitled "What About Candy for Children?" which was one of the special articles prepared for the magazine by the Southern California State Dental Association.

BULLETIN OF THE NATIONAL DENTAL HYGIENE ASSOCIATION

Dental Health, the official bulletin of the National Dental Hygiene Association, made its debut in February 1942.

The National Dental Hygiene Association of Washington, D. C., which is an independent, non-profit organization, proposes to publish *Dental Health* quarterly as part of their program for the advancement of dental health for the American people.

The editorial board of the new sixteen page publication consists of Mrs. J. E. Bush, Frank C. Cady, D.D.S., Anna C. Gring, R.N., and N. P. Neilson, Ph.D. The editor is Randolph G. Bishop; managing editor, Paul E. Morgan; associate editor, Cullison Cady. Mr. Cady is also staff artist.

The leading article in Volume 1, Number 1, by Lieut. Com. Raymond C. Wells (DC), U.S.N.R., Chief Dental Officer, Medical Division, National Headquarters, Selective Service System, Washington, D. C., deals with the national dental health needs. Dr. Wells calls to attention the fact that approximately 188,000 selectees were rejected for military service because of dental defects and that the great number of rejections of our men has been a means of emphasizing to the general public our lack of physical preparedness.

This issue also contains a brief statement regarding the Martha M. Hall Foundation, which finances the National Dental Hygiene Association.

Roscoe C. Brown, health education specialist of the U. S. Public Health Service, discusses the dental needs of the negro, and Helen D. Bulkley describes in great detail the Springfield, Mass., dental clinic. "Dental Care in Boston" is presented by Josephine J. Albrecht, and Paul E. Morgan, assistant secretary of the National Dental Hygiene Association, has an interesting article entitled "The Army's Toothache," which is based largely on material gathered by Klein and Palmer at Hagerstown, Md.

The format of the publication is as interesting as the contents and the many friends of the new organization wish its efforts well.

COUNCIL ON DENTAL THERAPEUTICS

THE TREATMENT OF VINCENT'S INFECTION

THE following report has been authorized for publication by the Council.

HAROLD L. HANSEN, *Secretary.*

THE extent of the interest in Vincent's infection is amply shown by the number of articles on the subject in the dental and medical literature. The topic is also frequently discussed at clinics and other meetings.

It is not the referee's purpose to enter into an extended discussion of the etiology, classification or prevention of Vincent's infection. All of these topics have been discussed in a number of other articles and in textbooks. Before a consideration of the treatment of Vincent's infection is undertaken, the referee would merely mention, however, the following points: Apparently, a large number of clinicians consider a fusiform bacillus and a spirochete acting in symbiosis as the direct causative agents of the disease. This is really an assumption rather than an established fact. These organisms and other members of the oral flora in Vincent's infection await further investigation. This is essentially the viewpoint of Mack,[1] Becks,[2] Lyons[3] and others. The etiology of Vincent's infection has been discussed by Rosebury,[4] who has pointed out that several distinct varieties of spirochetes and several kinds of fusiform bacilli, together with spirilla, vibrios, streptococci and other organisms, have been found in the lesions of Vincent's infection.

There is lack of agreement as to the diagnostic value of bacteriologic smears, so frequently mentioned in the literature and in textbooks. However, even those who use such smears generally agree that they are not of much value in the absence of a clinical examination. There appears to be general agreement to the effect that a number of conditions may be predisposing factors in the disease. Among such factors may be mentioned debilitating disease, blood dyscrasia, chronic irritation of a physical or chemical nature and dietary deficiency. The exact rôle of none of these predisposing factors has been defined. It has been stated that deficiency in any one of the following, vitamin D, ascorbic acid, vitamin B_2 and nicotinic acid, is conducive to the development of Vincent's infection.[5, 6, 7, 8, 9, 10,11] Many cases, however, have not been related to such deficiencies or to other easily recognized predisposing causes. Apparently, we do not know enough about Vincent's infection to permit anything but rather broad generalizations in this connection.

It is rather difficult to make an exact count of the number of drugs or combinations of drugs which have been advocated for the treatment of Vincent's infection. The number is, however, so large that it moved two writers[12] to remark: "The number and variety of medicaments used is so extensive it would seem that almost anything would do."

Many of the agents used were chosen either because they are oxidizing agents or because they had previously been described as effective agents in the treatment of diseases associated with the spirochete. It is quite common practice to use both oxidizing agents and arsenicals or similar substances in the treatment of a case, possibly in the hope that if one agent fails, the other will be effective, or because it is considered that two types of agents are required to com-

bat the two types of organisms presumably responsible for the disease.

Among the oxidizing agents which have been used are chromic acid, sodium perborate, hydrogen peroxide, potassium chlorate, potassium dichromate, potassium permanganate, sodium hypochlorite and other chlorinated substances which really are oxidizing agents. Of the foregoing, potassium dichromate and potassium chlorate are probably not oxidizing agents under the conditions of use. These substances do not readily give up oxygen in the body. Also, sodium perborate is not so active as an oxidizing agent as has been thought in the past. It must be remembered that most of these substances are not solely oxidizing agents. For example, chromic acid in the concentrations commonly used is strongly acidic, and escharotic, and may therefore be harmful, particularly if used carelessly. Sodium perborate is quite alkaline. Substances which give up oxygen rapidly, such as hydrogen peroxide, exert a mechanical cleansing action.

Arsenic preparations are apparently used rather frequently. Among these are solution of potassium arsenite, arsphenamine, neoarsphenamine, sulfarsphenamine and mapharsen. Bismuth compounds, such as bismuth sodium tartrate, are also used. As indicated previously, these agents were first tried in Vincent's infection because of their original use in the treatment of syphilis.

A number of other agents which cannot be classified either as oxidizing agents or spirocheticides have also been employed. Among these are camomile, mercurochrome, metaphen, soaps of various sorts, zinc sulfate and zinc chloride. The Council has considered scores of agents or mixtures which have been stated to be useful in the treatment of Vincent's infection. Reports on these have appeared in THE JOURNAL.

It would be useless to attempt to evaluate the assertions made in the literature concerning the efficacy of this or that agent in the treatment of Vincent's infection. The referee has noted, however, that there is scarcely one of them for which it is not possible to find diametrically opposed viewpoints. The following authors, among others, have reported that chromic acid is of value in the treatment of Vincent's infection: Cobe and Grace,[13] Goodrow,[14] Hardgrove[15] and Merritt.[16] On the other hand, Albray,[17] Lyons,[3] Marco[18] and others find that chromic acid is either useless or does more harm than good. Sodium perborate is apparently used by a number of practitioners,[19, 20, 21, 22] but its use is not recommended by others.[23, 24, 3, 25] Intravenous injection of arsenicals has been advocated by a number of individuals,[26, 27, 28] whereas it has been variously described as dangerous, of limited usefulness or irrational by others.[29, 30, 13, 31, 32]

This situation would not be so confusing were it not that the opinions expressed are almost invariably without a foundation of recorded facts obtained under controlled conditions. Although mention has been made of comparative tests in isolated instances, no data were presented. In short, the individual dentist, for lack of adequate experimental evidence, resorts to those agents which he had been taught to use or which have been presented in the most glowing terms. It may well be that some of the products thus used perform a useful function, but it is hard to understand how they all could. Several clinicians[33, 34, 3] have expressed opinions to the effect that drugs may be no more important or actually less important than other measures designed to improve oral cleanliness and general health.

The Council is frequently called upon to form opinions on products sold to be used in the treatment of Vincent's infection. Individual dentists frequently ask for opinions on a number of preparations. Up to the present time, it has not been possible to consider these products

in that manner which the situation warrants. Claims are sometimes made for single agents on the strength of results obtained with this agent, plus several others used simultaneously.

On a number of occasions, it has been emphasized that investigations on medicaments, if they are to provide clear-cut results, must be so conducted as to provide for adequate appraisal. When an investigation has been completed, the observations should indicate whether the medicament studied produced results differing from those afforded by some selected standard agent or, as may have been dictated by experimental requirements, whether use of the drug studied gives results differing significantly from those obtained when an inert agent is applied in the same manner. In brief, the use of an adequate control is essential in biologic investigations. Ideally, there should be a single variable under consideration in scientific testing. This is a point of fundamental importance, but one which is frequently disregarded. Both the medical and the dental literature are filled with reports which are of limited value or are entirely useless because of the investigator's failure to provide adequate controls.

Obviously all experimental requirements have not been met with the establishment of adequate controls. There is no substitute for careful and keen observation, which is a composite of natural ability, conscientious effort and proper training. Moreover, account must be taken of unintentional bias, especially in clinical observations. The subjective factor may be ruled out by means of the "blind-test" technic. In those cases in which simple deductions may not be drawn from the data because of the influence of normal biologic variations, recourse may be had to statistical means of evaluation, which aid in determining whether the differences observed are significant. But it must never be forgotten that statistical results indicate trends only and have no direct bearing on the individual case, or cases, under different conditions.

The Council has come to the conclusion that products currently used and those which may be advocated for use in the future should be tested in accordance with accepted scientific principles in order that the treatment of Vincent's infection may be placed on a more rational basis. In the future, the Council will require that agents submitted for consideration and advocated for the treatment of Vincent's infection have a background of acceptable clinical trial. Likewise, the continued acceptance of agents now included in the list of accepted products is contingent on the accumulation and presentation of acceptable evidence.

Objection may be raised to such a stand on the basis that the diagnosis of Vincent's infection in all of the phases described or suggested in the literature is subject to differences of opinion. There appears, however, to be no sound reason for believing that the recognition of the clinical entity, acute Vincent's infection, suffers from this disadvantage. Certainly a start can be and should be made in order to determine the efficacy or lack of efficacy of the drugs used or advocated in the treatment of this condition. Beyond this, there is a need for a number of fundamental investigations on this disease.

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ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following article in the list of Accepted Dental Remedies.

ANESTHETICS—LOCAL*

Monocaine Hydrochloride: The Council announces acceptance of the following dosage form of monocaine hydrochloride (J.A.D.A., 28:1341, August 1941).

Monocaine HCl-Epinephrine Tablets: Each tablet is stated to contain: monocaine hydrochloride, 0.01 gm.; epinephrine, 0.0000133 gm.; sodium chloride, 0.007 gm.; disodium phosphate, 0.0015 gm.; sodium bisulfite, 0.001 gm. One tablet dissolved in 1 cc. of sterile distilled water will give a solution of 1 per cent monocaine hydrochloride with 1:75,000 epinephrine. Marketed in vials of 100 and 500 tablets.

Manufactured by Novocol Chemical Mfg. Co., Inc., Brooklyn, N. Y.

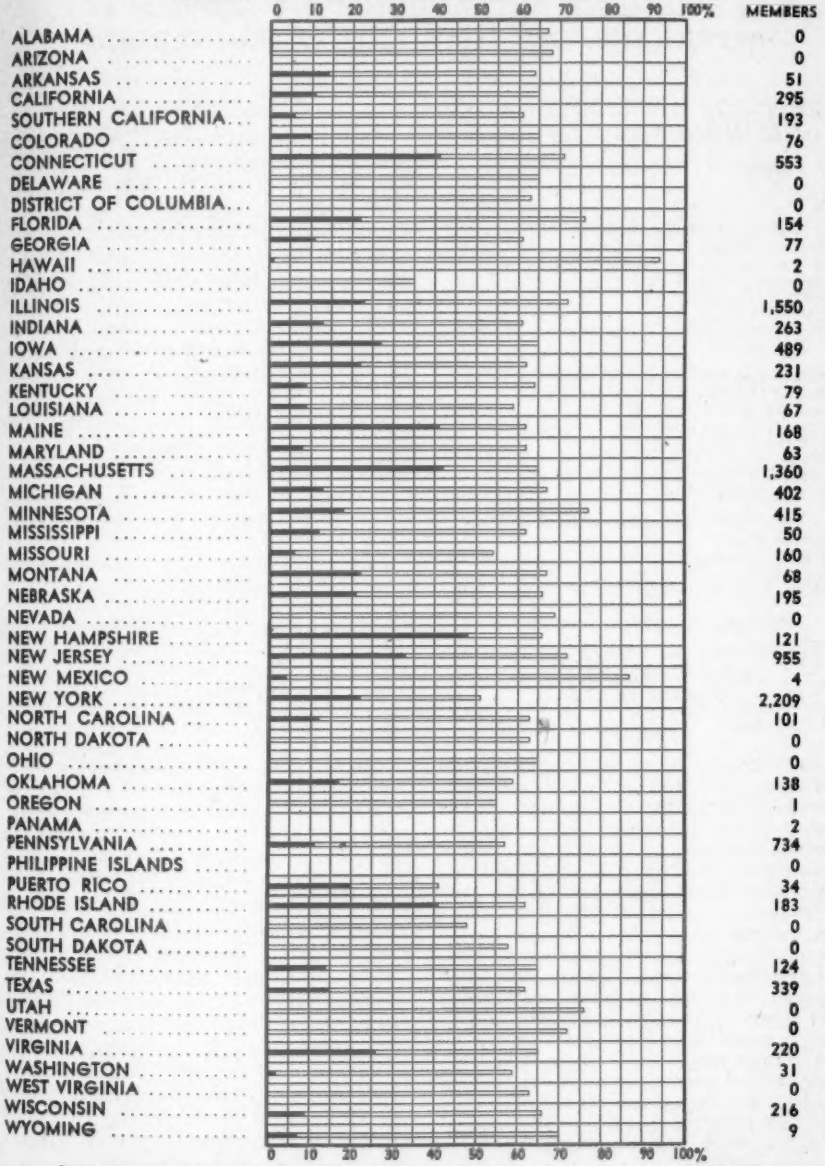
Admission of an article to the list of Accepted Dental Remedies does not imply a recommendation. Information regarding the rules and work of the Council will be sent on request.

HAROLD L. HANSEN, *Secretary.*

*A.D.R. Ed. 7, p. 38.

Membership Page

PERCENTAGE OF DUES RECEIVED IN CENTRAL OFFICE AS OF JANUARY 31, 1942, AS COMPARED TO 1941 MEMBERSHIP



Percentage based on dental population figures supplied by the State Society Secretaries.

1942 percentage. 1941 percentage.

DENTAL PREPAREDNESS

PROCUREMENT AND ASSIGNMENT SERVICE FOR PHYSICIANS, DENTISTS AND VETERINARIANS

OFFICE OF DEFENSE HEALTH AND WELFARE SERVICES

PAUL V. McNUTT, Director

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Address all communications to

Procurement and Assignment Service
601 Pennsylvania Ave.
Washington, D. C.

PREFACE

The Directing Board of the Procurement and Assignment Service, through the Committee on Information, has drawn up the following information regarding the organization and functions of the Procurement and Assignment Service. This publication is designed to answer questions which may arise in the minds of individual physicians, dentists and veterinarians concerning the activities of the Procurement and Assignment Service.

In the appendixes are complete lists of the various cooperating committees and agencies that should be consulted with regard to matters of policy pertaining to their offices.

The corps area officers and the state chairmen in the respective professions will be available for consultation and advice.

For the Directing Board.
S. F. SEELEY, M.D., Major, M. S., U.S. Army, Executive Officer,
Procurement and Assignment Service.

HISTORY

The Procurement and Assignment Service was authorized by the President on Oct. 30, 1941. The creation of this agency resulted from a recommendation from the Subcommittee on Education to the Health and Medical Committee of the Office of Defense, Health and Welfare Services on March 31, 1941. Following a meeting of the Health and Medical Committee on April 28, this recommendation was transmitted to the Committee on Medical Preparedness of the American Medical Association for its consideration. The latter committee presented the recommendation to the House of Delegates of the American Medical Association, which resolved:

That the United States government be urged to plan and arrange immediately for the establishment of a central authority with representatives of the civilian medical profession to be known as the Procurement and Assignment Agency for physicians for the Army, Navy and Public Health Service and for the civilian and industrial needs of the nation.

On Oct. 22, 1941, the Health and Medical Committee named a commission to draft a plan for development of such a service. As a result of the meeting of this commission, it was recommended that an office for procurement and assignment of physicians, dentists and veterinarians should be established, that the office should be a part of the Office of Defense Health and Welfare Services and that the function of the office should be to procure personnel from existing qualified members of the professions concerned. The Procurement and Assignment Services, through the facilities of the Office of Defense, Health and Welfare Services, would have available the fiscal budgetary, legal and advisory departments of a well

established governmental agency. The concluding paragraphs of its report are as follows:

For this reason a special commission, appointed by the Health and Medical Committee of the Office of Defense Health and Welfare Services, has made the following recommendations:

1. That an Office of Procurement and Assignment of physicians, dentists and veterinarians be established.

2. That this office shall function as part of the Office of Defense, Health and Welfare Services, which is itself a part of the Office for Emergency Management.

3. The function of this office shall be to procure personnel from existing qualified members of the professions concerned. The office shall receive from various governmental and other agencies requests for medical, dental and veterinary personnel. These requests shall indicate the number of men desired, the time during which they must be secured, the qualifications and limitations placed on such personnel. The office must then by appropriate mechanism arrange to secure lists of professional personnel available to meet these requirements, utilizing such existing rosters, public and private, as it may find acceptable. It shall also be authorized to approach such professional personnel as is considered to be available and to use suitable means to stimulate voluntary enrolment.

4. The Office of Procurement and Assignment shall consist of a board of five members, one of whom shall be chairman. This board shall be chosen from members of the medical, dental or veterinary professions and shall not include any salaried employees of the federal government. This board shall function without salary but shall be entitled to actual and necessary transportation, subsistence and other expenses incidental to the performance of its duties.

5. The board shall appoint an executive secretary who shall serve also as executive officer and who shall be without vote in its deliberations and decisions. He shall serve as a full time employee with salary (to be determined) and with such assistants as the board may determine necessary to carry out its functions.

6. The board shall be authorized to establish such advisory committees and subcommittees as may be necessary. These committees shall represent the various interests concerned, such as medical, dental and veterinary schools, hospitals, Negro physicians and woman physicians. Members of such committees shall serve without salary but shall be entitled to actual and necessary transportation, subsistence and other expenses incidental to the performance of their duties.

7. The board shall also be authorized to request various agencies of the government using medical, dental or veterinary personnel to appoint liaison officers and representatives to advise the board in carrying out its functions.

8. In carrying out its functions the board shall cooperate with such agencies as are now established under the Selective Service as well as other federal agencies.

On Oct. 30, 1941 the following letter to the President from the Director of Defense Health and Welfare Services was approved by the President and constitutes the authority under which the Procurement and Assignment Service operates:

October 30, 1941.

My Dear Mr. President:

The coordination of the various demands made on the medical, dental and veterinary personnel of the nation and the most efficient utilization of this personnel would seem to require the establishment of a special agency capable of recording the qualified personnel available, of assigning or encouraging enlistment of such personnel in the services where most needed and of giving every qualified physician, dentist and veterinarian an opportunity to enroll himself in some service demanded by the national need.

For these reasons I wish to propose that there be established as one of the principal subdivisions of the Office of Defense Health and Welfare Services an office for the procurement and assignment of physicians, dentists and veterinarians. This office would be known as the Procurement and Assignment Agency.

The functions of the agency would be (1) to receive from various governmental and other agencies requests for medical, dental and veterinary personnel, (2) to secure and maintain lists of professional personnel available, showing detailed qualifications of such personnel, and (3) to utilize all suitable means to stimulate voluntary enrolment, having due regard for the overall public health needs of the nation, including those of governmental agencies and civilian institutions.

The agency would consist of a board of five members, one of whom would serve as chairman. The board would serve without salary, but would be entitled to actual and necessary transportation, subsistence and other expenses incidental to the performance of its duties.

A full time executive officer (with salary

to be determined) would be appointed, together with such assistants as would be required to carry out the functions of the Agency.

I recommend that the board be composed of Dr. Frank H. Lahey, chairman, Dr. James E. Paullin, Dr. Harvey B. Stone, Dr. Harold S. Diehl and Dr. C. Willard Camalier.

This communication is addressed to you in accordance with provisions contained in paragraph 4 of the Executive Order, dated Sept. 3, 1941, "Establishing the Office of Defense Health and Welfare Services in the Executive Office of the President and Defining Its Functions and Duties," to the effect that the President shall approve the establishment of the principal subdivisions of the Office of Defense Health and Welfare Services and the appointment of the heads thereof.

In the event you approve the establishment of the Procurement and Assignment Agency, together with the board membership as recommended, I shall proceed immediately with the creation of the agency and will prepare budget estimates in the amount of approximately $50,000 for submission to the Budget Bureau to cover the costs of the agency.

In addition I would propose to instruct the Agency to draft legislation which may be necessary to submit to the Congress providing for the involuntary recruitment of medical, dental and veterinary personnel, in the event the exigencies of the national emergency appear to require it.

Sincerely yours,

Approved PAUL V. McNUTT,
FRANKLIN D. ROOSEVELT. Director.

This letter was approved by the President, Oct. 30, 1941, and the Procurement and Assignment Service was organized accordingly.

LOCATION OF OFFICES

Central Office.—The accompanying chart shows the organization of the Procurement and Assignment Service. The executive officer is Sam F. Seeley, M.D., M.C., U. S. Army. The central office is located at 601 Pennsylvania Avenue N.W., Washington, D. C. To facilitate correspondence, all communications should be addressed to the central office.

Consultant Office.—A consultant office has been established in the headquarters of the American Medical Association, 535 North Dearborn Street, Chicago, under the supervision of Dr. R. G. Leland, where special information regarding physicians is maintained. Similar information regarding dentists is available at the headquarters of the American Dental Association, 212 East Superior Street, Chicago, and regarding veterinarians at the headquarters of the American Veterinary Medical Association, 600 South Michigan Avenue, Chicago. These facts include those supplied directly to the organizations concerned, the classifications developed by the special committees of the Division of Medical Sciences of the National Research Council and confidential information supplied by other agencies.

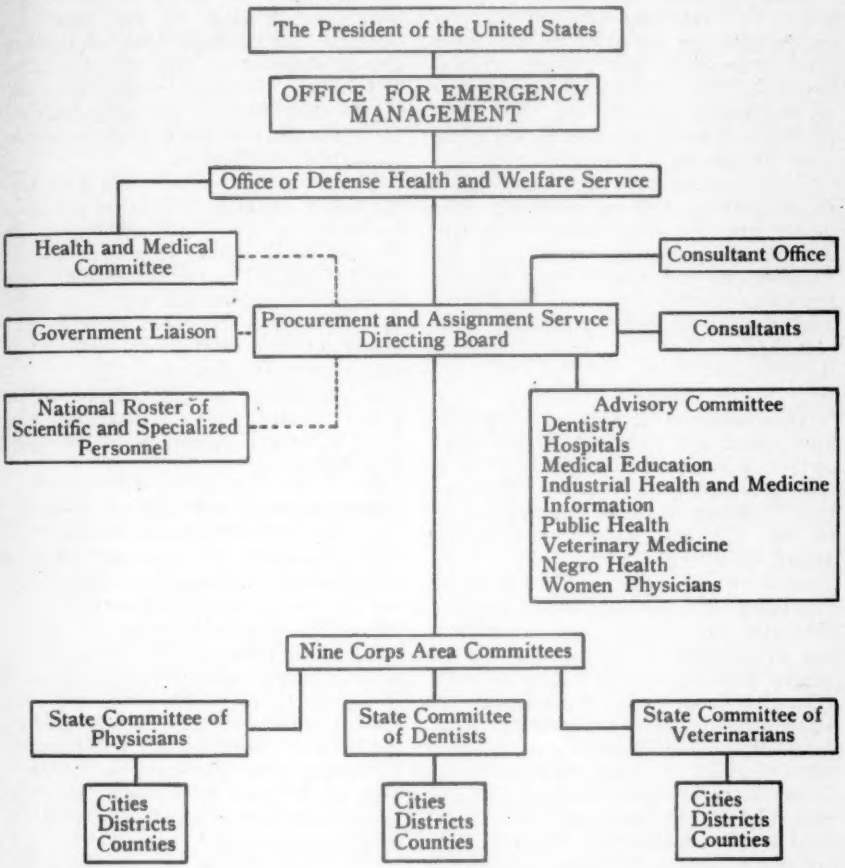
Corps Area Committees.—In each of the nine Army corps areas, a committee has been established. Each corps area committee includes a chairman, two physicians chosen from the general medical profession, a dentist chosen from the general dental profession, a representative of medical education, a representative of dental education, a representative chosen from the veterinary profession and a representative of the hospitals. These committees are advisory to the Procurement and Assignment Service in reference to questions relating to personnel and are part of the field organization of the Office of Defense Health and Welfare Services. The chairman of each of these committees acts in a liaison capacity to the corps area surgeons, and representatives of the Office of Civilian Defense, the Selective Service System in the corresponding corps areas. Liaison between the Procurement and Assignment Service and the Bureau of Medicine and Surgery, Navy Department, is maintained directly through the Executive Officer and a representative of the Bureau.

The following is a list of the nine corps area chairmen and the states in each corps area:

First Corps Area.—Chairman, Dr. W. G. Phippen, 31 Chestnut Street, Salem, Mass. States comprising corps area: Connecticut, Maine, New Hampshire, Rhode Island, Massachusetts, Vermont.

Second Corps Area.—Chairman, Dr. A. W.

ORGANIZATION OF THE PROCUREMENT AND ASSIGNMENT SERVICE



Booth, 222 West Church Street, Elmira, N. Y. States comprising corps area: Delaware, New Jersey, New York.

Third Corps Area.—Chairman, Dr. A. M. Shipley, University Hospital, Baltimore. States comprising corps area: Maryland, Pennsylvania, Virginia, District of Columbia.

Fourth Corps Area.—Chairman, Dr. Edgar H. Greene, 478 Peachtree Street N.E., Atlanta, Ga. States comprising corps area: Alabama, Florida, Georgia, Louisiana, Mississippi, Tennessee, South Carolina, North Carolina.

Fifth Corps Area.—Chairman, Dr. E. L. Henderson, 606 S. 4th Street, Louisville, Ky. States comprising corps area: Indiana, Kentucky, Ohio, West Virginia.

Sixth Corps Area.—Chairman, Dr. Charles Phifer, 30 North Michigan Avenue, Chicago. States comprising corps area: Illinois, Wisconsin, Michigan.

Seventh Corps Area.—Chairman, Dr. Roy W. Fouts, 107 S. 17th Street, Omaha. States comprising corps area: Arkansas, Iowa, Kansas, Minnesota, Missouri, Nebraska, South Dakota, North Dakota, Wyoming.

Eighth Corps Area.—Chairman, Dr. Sam E. Thompson, Kerrville, Texas. States comprising corps area: Arizona, New Mexico, Oklahoma, Texas, Colorado.

Ninth Corps Area.—Chairman, Dr. Charles A. Dukes, 426 17th Street, Oakland, Calif. States comprising corps area: California,

Idaho, Montana, Nevada, Oregon, Utah, Washington.

State Chairmen and State Committees.—The state chairmen and the state committees are advisory to the corps area committees and to the central office. To the state comittees and also to the county, district and local committees will be referred especially questions concerning the essential character of such services as a physician, dentist or veterinarian may be rendering, thus determining his availability. They will also familiarize themselves with the functions of the Procurement and Assignment Service and thus be able to advise those in their community concerning its work.

THE NATIONAL ROSTER

The National Roster of Scientific and Specialized Personnel was created by executive action in July of 1940 as an office within the Executive Office of the President to be jointly supervised by the National Resources Planning Board and the United States Civil Service Commission. Two primary functions were assigned to the Roster: first, the formulation of as complete a list as possible of all of the United States scientifically and professionally trained citizens; and, second, the development of proper procedures for the most effective utilization of the skill of these citizens in connection with defense and other governmental and national needs. In pursuance of this directive, the Roster has established a completely analytical punch card list of the names, locations, and qualifications of the country's specially trained individuals in more than fifty strategic scientific and professional fields. Because of the fact that the American Medical Association was engaged in developing its own roster, the National Roster did not undertake to include any but a small specialized group of the general medical profession. It became necessary therefore to work out an agreement of cooperation between the National Roster and the Procurement and Assignment Service so that the latter could have the benefit of the Roster's experience and facilities in maintaining up to date lists of physicians, dentists and veterinarians. By special action of the boards of trustees of the American Medical Association, the American Dental Association and the American Veterinary Medical Association, all punch card files in the possession of these associations were made available to the National Roster.

By these joint efforts, the Procurement and Assignment Service will have available in the National Roster at Washington complete records of all material submitted by the professions. The professions in turn will have the benefit of material collected through the roster for their own punch card files at their national headquarters.

A consultant committee to the National Roster for medicine includes Drs. Morris Fishbein, R. G. Leland, and Olin West.

INFORMATION UTILIZED IN THE PROCUREMENT AND ASSIGNMENT SERVICE

Questionnaire. — American Medical Association: Beginning in June 1940, the American Medical Association circulated a questionnaire to the physicians of the country. The information from this questionnaire was tabulated in a punch card system which has been made available to the National Roster. Additional information concerning physicians was developed by the Division of Medical Sciences of the National Research Council and other cooperating agencies.

American Dental Association: The American Dental Association has circulated a questionnaire to all dentists. The information thus secured has been placed in a punch card system in the headquarters of the American Dental Association and also made available to the National Roster. The information in the headquarters of the American Dental Association is supplemented by information secured from cooperating agencies.

American Veterinary Medical Association: Through cooperation between the American Veterinary Medical Association and the National Roster, a

punch card system covering the veterinary medical profession will be available in the National Roster and in the Headquarters of the American Veterinary Medical Association.

Following the declaration of war, Dec. 8, 1941, other questionnaires were immediately circulated with a view to securing lists of names of physicians who would offer their services for immediate utilization in the emergency. Since the supply of dentists and veterinarians was at this time adequate to meet the needs of the armed forces, additional enrolment forms were circulated only to physicians. As a result of this procedure the immediate needs of the armed forces were satisfied.

SPECIAL ENROLMENT FORM AND QUESTIONNAIRE FOR PROCUREMENT AND ASSIGNMENT SERVICE

The Procurement and Assignment Service, cooperating with the National Roster of Scientific and Specialized Personnel, has prepared special questionnaires for circulation to every physician, dentist and veterinarian in the United States. This questionnaire will come directly to all physicians, dentists and veterinarians as soon as possible after the National Registration on Feb. 16, 1942. *Every physician, dentist and veterinarian, regardless of age, sex, physical condition, citizenship or employment, should fill out and return the enrolment form and the questionnaire.* Those physicians, dentists and veterinarians who have been commissioned in any United States service previous to the receipt of the enrolment form and questionnaire should so indicate under the heading "remarks" on the enrolment form.

The original questionnaire and enrolment forms previously circulated by the American Medical Association, the American Dental Association and the American Veterinary Medical Association are being utilized to meet requisitions from the armed services and other agencies, until the National Roster is complete and the Procurement and Assignment Service is working routinely. The additional information secured by the special questionnaire now to be described will bring up to date the facts necessary to place each physician, dentist and veterinarian in the work for which he is best qualified.

Roster Questionnaire.—The questionnaire, as developed, includes space on which the physician, dentist or veterinarian will supply the usual data regarding name, address, date and place of birth, citizenship, marital status, race and sex, school of graduation, previous military service in the United States or in the armed forces of other countries, membership in the reserve corps or commissions in any branch of government service. Any additional information regarding special aptitudes, such as knowledge of aviation, radio or cryptanalysis, which might be of value, knowledge of foreign languages and foreign travel will also be included. Again, it should be emphasized, this information is sought to supplement information previously supplied on questionnaires. It is recognized that the status of any physician, dentist or veterinarian may have changed materially since the time when previous questionnaires were submitted. The new questionnaire will also be tabulated in a special punch card system which will be coordinated with the punch card systems previously mentioned.

In the new questionnaire, opportunity is also given to state in detail appointments held in various local, industrial, state or government agencies, in civil practice, and in education and research. Specialization is recognized by appropriate designations which coordinate with certification of specialists by the certifying boards and also with appointments on the staffs of hospitals and other indications of special practice.

The method of practice, whether individual, in partnership or in groups is indicated. Finally an opportunity is given to every physician, dentist and veterinarian to indicate his preference as to the type of service which he will be capable of rendering to the United States during the war.

The Enrolment Form.—On the enrolment form which comes with the

questionnaire the physician, dentist or veterinarian voluntarily enrols himself with the Procurement and Assignment Service. He indicates his first, second, third and fourth preferences of the military, governmental, industrial or civil categories that may require his assistance.

Announcement will be made repeatedly in medical, dental and veterinary medical publications of the time when the circulation of the enrolment form and the questionnaire begins. When you receive your enrolment form and questionnaire, PLEASE ACT PROMPTLY. Those who fail to receive an enrolment form and questionnaire are requested to write to the National Roster of Scientific and Specialized Personnel, 916 G Street N.W., Washington, D. C., within six weeks after announcement has been made that the circulation has begun.

CERTIFICATE AND INSIGNIA

Physicians, dentists and veterinarians who enroll with the Procurement and Assignment Service will receive a numbered certificate indicating that they have made themselves available and will be privileged to wear insignia indicating that such enrolment has been made.

PROCEDURE TO MEET PRESENT NEEDS

The present Army and Navy needs are for physicians under 36 years of age. Those under 36 desiring immediate commission may write now to the Procurement and Assignment Service, 601 Pennsylvania Avenue N.W., Washington, D. C. Their letters will be treated as applications and those who are qualified will receive proper application forms with view of commission in the Army or the Navy. All physicians over 36 and all dentists and veterinarians should await the receipt of the enrolment forms.

METHODS OF ACTION OF THE PROCUREMENT AND ASSIGNMENT SERVICE

By authority of the President, the Procurement and Assignment Service receives requests for personnel from the following governmental agencies:

MEDICAL

United States Army Medical Corps.
United States Navy Medical Corps.
United States Public Health Service.
United States Veterans Administration.
United States Civil Service Agencies.
St. Elizabeth's Hospital (Washington, D. D.), Resident Staff and Interns only.
United States Indian Service.
Panama Canal Service.
Office of Civilian Defense (full time).

DENTAL

United States Army Dental Corps.
United States Navy Dental Corps.
United States Public Health Service.
United States Veterans Administration.
United States Indian Service.
Panama Canal Service.
Office of Civilian Defense.

VETERINARY

United States Army Veterinary Corps.
United States Navy Hospital Corps Specialists.
United States Public Health Service.
United States Bureau of Animal Industry.
Federal Extension Service.
State Extension Service.
United States Department of Agriculture Marketing Service.
War Department (Federal Civil Service Status—not Army).
Federal Agricultural Experiment Stations.

The Procurement and Assignment Service is also charged with the stimulation of voluntary enrolment, having due regard for the overall health needs of the nation, including the personnel of civilian institutions.

When a request is received from a federal agency for medical, dental or veterinary personnel, the names of those who are qualified to meet the specifications established by the requisitioning agency, who are available and who have indicated, by enrolling with the Procurement and Assignment Service, their willingness to apply for a commission or employment are supplied by the National Roster, utilizing the punch card system previously described. These names are arranged in lists by states. A copy of each list is forwarded to the Consultant Office of

physicians, dentists or veterinarians, respectively, where each is made more accurate by the elimination of the names of those who do not qualify in view of the special information held in the Consultant Office. These lists are then referred to the state chairmen, who make a decision as to the immediate availability of the physicians, dentists or veterinarians concerned. Such a step is necessary because the availability of the individual may have changed in the period between the return of the official questionnaire in March 1942 and the time when the physician, dentist or veterinarian is notified of the need for his services. The lists are then forwarded by the state chairmen to the Procurement and Assignment Service in Washington.

From these lists the central office obtains the names of those individuals who have thus been found qualified and available.

PHYSICIANS, DENTISTS OR VETERINARIANS FOR THE UNITED STATES ARMY MEDICAL DEPARTMENT

The procedure with reference to supplying personnel to the United States Army Medical Department is governed by the following letter of instruction sent out by the Adjutant General's Office to all corps area and department commanders on Jan. 21, 1942:

WAR DEPARTMENT
The Adjutant General's Office
Washington

January 21, 1942

Subject: Procurement of Officers for Medical Department, Army of the United States.

To: All Corps Area and Department Commanders.

1. Letter from this office dated Feb. 3, 1941, file AG 381 (8-13-40) R-A, Subject: "Assistance of the American Medical Association in the classification and procurement of physicians for military service," is rescinded.

2. There has been established under the Office for Emergency Management, Office of Defense Health and Welfare Services, a Procurement and Assignment Service to coordinate the procurement of physicians, dentists and veterinarians for all governmental, industrial and civilian requirements.

3. In order to expedite appointments in the Medical Corps, Dental Corps and Veterinary Corps, Army of the United States, the following procedure will govern the processing of all applications.

(*a*) All individual inquiries for information concerning a commission or offers to serve as a medical, dental or veterinary officer should be acknowledged by the headquarters receiving the communication and the communication itself forwarded by indorsement to the Executive Officer, Procurement and Assignment Service, Office of Defense Health and Welfare Services. Social Security Building, Washington, D. C.

(*b*) The Procurement and Assignment Service will supply to individual applicants who are eligible and qualified for appointment the required forms (WD AGO Form No. 170, "Application for Appointment and Statement of Preferences for Reserve Officers," in duplicate, and WD AGO Form No. 178 and 178-2, both in duplicate) together with a request on the surgeon of the nearest Army post for a final type physical examination. Each request for final type physical examination authorized by the Procurement and Assignment Service will be honored by surgeons of Army posts. Application forms and supporting papers, except the report of physical examination, will be returned by the applicant to the Procurement and Assignment Service; the report of physical examination (WD AGO Form No. 63) will be forwarded by the surgeon of the station at which the examination was conducted, direct to the Surgeon General.

(*c*) The completed applications and supporting papers, except report of physical examination, will be transmitted by the Procurement and Assignment Service to the Surgeon General together with a statement by that service derived from its files and regarding eligibility of the applicant for appointment in the Medical, Dental and Veterinary Corps, Army of the United States, as prescribed by current Army regulations. The Procurement and Assignment Service will also furnish the Surgeon General with the professional classification and evaluation of the applicant as determined from the recent nationwide survey made by the Committee on Medical Preparedness of the American Medical Association.

(*d*) The Surgeon General will forward such completed applications to the Adjutant General as prescribed in paragraph 10 (4), Army Regulations No. 605-10, and inform the

Procurement and Assignment Service of action recommended.

4. No change in the present procedure for the appointment of graduates of medical units of the Reserve Officers' Training Corps in the Medical Corps Reserve or for appointment in the Army of the United States of physicians and dentists for affiliated units, of junior and senior students in medical schools in the Medical Administrative Corps, Army of the United States, or of graduates of such schools who are to be appointed in the Medical Corps, Army of the United States, on graduation.

5. When the applications for appointment have been approved the Adjutant General will notify the applicant direct of his appointment with instructions as to proper completion of oath of office and finger print card and the return of such forms direct to the Adjutant General. When the oath of office has been received by the Adjutant General, the Surgeon General and the Executive Officer, Procurement and Assignment Service of the Office of Defense Health and Welfare Services, Office for Emergency Management, Washington, D. C., will be notified.

By Order of the Secretary of War.

(Note: Address now 601 Pennsylvania Avenue N.W., Washington, D. C.)

In summary, the procedure is as follows:

1. The Surgeon General requisitions needed personnel from the Central Office of the Procurement and Assignment Service.

2. The National Roster prepares an appropriate list of names from the National Roster of Scientific and Specialized Personnel.

3. The National Roster sets aside the cards from the file of those available.

4. This list is forwarded to the Consultant Office, Procurement and Assignment Service.

5. The Consultant Office forwards the names to the chairmen of relevant state committees of the Procurement and Assignment Service.

6. These chairmen forward to the central office the lists they received, with names of unavailable (essential) persons indicated.

7. The Central Office mails application forms and authority for physical examination to the qualified and available proposed applicants.

8. Each applicant applies for "final type" physical examination at the nearest Army post.

9. The examiner sends the report to the Surgeon General's Office.

10. The applicant returns his completed application blank and supporting papers direct to the Central Office of the Procurement and Assignment Service.

11. The central office forwards the application form and the supporting papers direct to the Surgeon General.

12. The Surgeon General's Office joins the completed application blank, supporting papers and the corresponding report of physical examination.

13. The Surgeon General's Office determines whether or not to recommend the applicant to the Adjutant General on the basis of physical and professional qualifications.

14. The Adjutant General notifies the applicant that he has or has not been appointed.

15. The Central Office of the Procurement and Assignment Service is notified whether the applicant has been, or has not been, appointed.

16. The names of those not commissioned are again placed in the file of the National Roster so that the persons affected may be available for other service.

NOTE.—After the applicant has sent his application form and supporting papers to the Central Office of the Procurement and Assignment Service, he may expect his further correspondence to be carried on with the Surgeon General's Office or the Adjutant General's Office.

PROVISION OF PHYSICIANS AND DENTISTS FOR THE UNITED STATES NAVY MEDICAL AND DENTAL CORPS

When a request is received from the United States Medical or Dental Corps for personnel, the same procedure will be followed in securing lists of names as has already been described in the previous section regarding the provision of personnel for the Army. The list of names received from the state chairman will then be forwarded by the Procurement and Assignment Service to the Bureau of Medicine and Surgery, Navy Department, Washington, D. C.

The Bureau of Medicine and Surgery will then conduct negotiations with the physicians and dentists concerned through the commandants of their respective naval districts. Should a physician or dentist apply directly to a naval commandant for commission in the United States Naval Medical or Dental Corps, the procedure outlined in the following letter from the Bureau of Medicine and Surgery to the commandants of all naval districts, dated Feb. 3, 1942, prevails:

February 3, 1942.

From: The Chief of the Bureau of Medicine and Surgery.

To: The Commandant, All Naval Districts.

Subject: Status of Procurement and Assignment Service for Physicians, Dentists and Veterinarians in connection with recruitment of medical and dental officers for the U. S. Naval Reserve.

1. The Secretary of the Navy has approved the recommendations of the Chief of the Bureau of Medicine and Surgery whereby the services of the "Procurement and Assignment Service, of the Defense Health and Welfare Services," an organization recently created by the President, may be utilized by the Navy in facilitating the recruitment of medical and dental officers for the U. S. Naval Reserve.

2. The primary function of the above mentioned service as pertains to the Navy is to furnish information which indicates certain applicants for appointment in the Medical and Dental Corps of the Naval Reserve either do or do not occupy positions in civil life which are considered essential to the national defense, to the proper functioning of medical and dental schools or whose acceptance of appointments in the Naval Reserve would jeopardize the health and welfare of a local community, such as removing the only qualified orthopedic surgeon from a community composed practically entirely of miners or workers in a factory producing materials essential to the government.

The furnishing of such information to the commandants, before investigation of an applicant, would be of distinct advantage in that the number of investigations would be materially reduced and, in the case of applicants considered essential or holding civilian appointments connected with national defense, need not be accomplished.

3. In this connection, the following procedure is suggested with the request that it be executed by the District Medical Officer on all applications received after Feb. 16, 1942:

(*a*) Whenever a physician or dentist makes application for appointment, four copies of the enclosed form are to be immediately filled out and the original and two copies forwarded to the Bureau of Medicine and Surgery. It is desired these forms be forwarded when the first contact is made in any given case, without waiting for the applicant to return his completed application.

(*b*) The Bureau of Medicine and Surgery will retain one copy and send the original and one copy to the Executive Secretary of the Procurement and Assignment Service.

(*c*) When the Executive Secretary of the Procurement and Assignment Service has placed his endorsement thereon, he will return both copies to the commandant concerned.

(*d*) If the candidate is not cleared, both copies should be forwarded by the commandant to the Bureau of Medicine and Surgery and the candidate informed by the commandant his application cannot be accepted in view of the action of the Procurement and Assignment Service. The Bureau of Medicine and Surgery will make the second endorsement, retain the original and forward the copy to the Executive Officer of the Procurement and Assignment Service.

(*e*) If the candidate is cleared, both the original and the copy of the form should be forwarded to the Bureau of Navigation with the application. After final action is taken the Bureau of Medicine and Surgery will make the second endorsement, retain the original and forward the copy to the Executive Officer of the Procurement and Assignment Service.

(*f*) About fifty copies of the form adaptable for this purpose are enclosed to serve as a sample of others to be mimeographed or printed locally.

Ross T. McINTIRE.

In summary, the procedures for Navy procurement are as follows:

1. The Bureau of Medicine and Surgery requisitions personnel from the central office of the Procurement and Assignment Service.

2. An appropriate list of names is prepared from the National Roster of Scientific and Specialized Personnel.

3. The National Roster sets aside the cards bearing these names from the file of those available.

4. The list is forwarded to the Consultant Office, Procurement and Assignment Service.

5. The Consultant Office forwards the names to the chairmen of relevant state committees of the Procurement and Assignment Service.

6. These chairmen forward to the central office the lists they received, with names of unavailable (essential) persons indicated.

7. The central office forwards the names of qualified and available persons to the Bureau of Medicine and Surgery.

8. The Bureau of Medicine and Surgery conducts the subsequent negotiations with the proposed applicants.

9. The Bureau of Medicine and Surgery notifies the central office of the Procurement and Assignment Service which applicants have been and which have not been appointed.

10. The names of those not commissioned are again placed in the file of the National Roster, so that the persons affected may be available for other services.

When an applicant applies directly to any Army installation for commission in the Army Medical or Dental or Veterinary Corps, he is referred to the Procurement and Assignment Service. When an applicant applies to any Naval Commandant for commission in the U. S. Medical or Dental Corps, his application is sent to the Bureau of Medicine and Surgery and such names are cleared through the Procurement and Assignment Service before the commissions are granted.

UNITED STATES PUBLIC HEALTH SERVICE

The Surgeon General of the United States Public Health Service has issued the following circular to all District Directors and Medical Officers in Charge concerning new appointment procedure for physicians and dentists:

February 14, 1942.

1. The Procurement and Assignment Service within the Office of Defense Health and Welfare Services has the responsibility for assisting in the procurement and assignment of physicians and dentists in such manner as to best serve the overall health and medical needs of the country. It is essential that the personnel policy of the Public Health Service be consistent with the major purposes of the Procurement and Assignment Service.

2. It is desired that applications be solicited from qualified physicians and dentists for commission in the reserve corps of the U. S. Public Health Service. The expansion of the reserve corps of the Public Health Service is necessary to serve two major purposes:

(*a*) The creation of a pool of qualified public health personnel to safeguard essential civilian health services and at the same time to be available for immediate, though temporary, active duty in the event of some major public health emergency.

(*b*) The procurement of sufficient numbers of qualified physicians and dentists to enable the Public Health Service to carry on its normal and war-time activities.

3. In order to serve these two major purposes, it will be necessary to recruit into the reserve of the Public Health Service physicians and dentists who come within the two following categories:

(*a*) Those who are now engaged in public health work and who by reason of special training and experience occupy strategic positions in their present civilian capacities. Such personnel would be expected to remain on inactive status with the Public Health Service, except in the event of a major disaster, in which case they would be subject to immediate, though temporary active duty.

(*b*) Those who are professionally qualified and also available for immediate active duty in the Public Health Service for such periods of time as the exigencies of the service may determine.

4. Applications from physicians and dentists relating to commissions in the reserve of the Public Health Service will be processed in the following manner: On receipt of an application by the office of the Surgeon General, the application forms and all supporting papers, including the report of physical examination, will be transmitted with a definite recommendation of the Surgeon General to the Procurement and Assignment Service. The Procurement and Assignment Service will in turn certify to the Surgeon General as to the availability of the individual for appointment. In the case of public health personnel occupying strategic positions in civilian posts, the criterion of availability for commission would rest largely upon the fact that the individual occupies a strategic position, and therefore should remain as long as practicable on an inactive status. In the case of personnel to be called to immediate active

duty, the criterion of availability would be based upon the ability of the community to spare the services of the individual. Upon receipt from the Procurement and Assignment Service of notice of clearance, indicating that the applicant is available for a commission in the reserve of the Public Health Service, the appointment will be completed in the usual manner.

5. The above procedure does not apply to the recruiting of individuals for the regular corps of the Public Health Service, or to the appointment of interns or doctors certified by the Civil Service Commission, or to the appointment of sanitary engineer officers in the reserve.

6. When the Public Health Service is without acceptable applications from physicians and dentists for filling vacancies, the Surgeon General will request the Procurement and Assignment Service for the names and qualifications of persons available to fill such vacancies. When decision has been reached as to the selection or nonselection of such persons, the Surgeon General will advise the Procurement and Assignment Service.

7. The Procurement and Assignment Service has given its endorsement to the procedure outlined above.

THOMAS PARRAN,
Surgeon General.

Approved:
PAUL V. MCNUTT,
Administrator.

UNITED STATES CIVIL SERVICE COMMISSION

In accordance with the recommendation of the Medical Director, the United States Civil Service Commission has approved a procedure in connection with the recruitment of qualified persons whereby the Commission will cooperate with the Procurement and Assignment Service and deal directly with this service in its recruitment program.

1. The necessary application forms, all properly executed, are to be filed by the applicant with the United States Civil Service Commission at Washington, D. C. Information concerning necessary qualifications is to be obtained from the announcement of the examination. Application forms and announcements may be obtained from the United States Civil Service Commission, Washington, D. C.

2. Applications received under announcements of examinations for physicians, dentists and veterinarians will be rated by the United States Civil Service Commission.

3. The names of those applicants who have received an eligible rating will be submitted to the Procurement and Assignment Service, with the view of determining whether or not such applicants are essential in their present positions and localities.

4. The names of those persons who have been designated by the Procurement and Assignment Service as being essential in their present positions and localities will not be certified and such persons will be notified by the United States Civil Service Commission that they cannot be certified in view of the action taken by the Procurement and Assignment Service.

5. The names of those persons who have been designated as nonessential will be certified in routine manner to fill the personnel needs of the various government agencies under civil service rules and regulations.

MEDICAL, DENTAL AND VETERINARY EDUCATION

To meet the needs of the nation for a continuing supply of trained medical, dental and veterinary personnel for the armed forces and for civilian needs, and to maintain the standards of education which have prevailed in these fields, the medical, dental and veterinary professions initiated an effort as far back as 1940 to provide for deferment of students in qualified medical, dental and veterinary schools from induction under the provisions of the Selective Service acts. Through the cooperation of the Director of Selective Service, the following memorandums now prevail:

Deferments of Professional Students and Instructors.—The Selective Service System, Washington, D. C., on January 12, 1942, issued the following supplement to Memoranda (I-62), (I-91), (I-99) and (I-150) Occupational Deferment of Engineering, Chemical, Physics, Medical, Dental Students and Instructors (III):

The attention of local boards is again invited to the necessity of seriously considering for deferment students in certain specialized professional fields in which dangerously low levels of manpower are found to exist. This memoradum is in addition to and does not rescind those previously issued which apply to students in other critical fields.

Subsequent to the declaration of war, local Selective Service agencies have in many instances proceeded to classify registrants without regard to the fact that they are in

training or preparation for activities the maintenance of which is essential to the national health, safety or interest and war production. This is particularly true in cases of engineering, chemical, physics, medical and dental students.

Admittedly there is an overlapping of the military and civilian requirements of a nation at war; however, it must be borne in mind that the one is dependent on the other. It is estimated that the expanding army will eventually require doctors and dentists in numbers heretofore unknown. They will not be available if those students who show reasonable promise of becoming doctors and dentists are inducted prior to becoming eligible for commissions.

War industries are undergoing a hitherto unknown expansion. Aeronautical, civil, electrical, chemical, mining, metallurgical, mechanical and radio engineers together with physicists and chemists are essential to insure a sufficient flow of material for the armed forces, and industry must look to the engineering, chemical and physics students now in training to meet their present and future requirements.

It is equally important that instructors in these fields be seriously considered for occupational deferment. Shortages of qualified instructors are known to exist. The educational institution employing the instructor should be requested to file DSS Form 42A in all cases in which deferment is sought.

In considering student deferment cases, certain local boards are requiring the execution of DSS Form 42A in addition to the affidavit of the college or university contained in Bulletin No. 10 issued by the American Council on Education. DSS Form 42A should not be required when the American Council on Education affidavit has been submitted.

Local boards will be informed when the manpower requirements necessary to the national health, safety or interest and war production become static. Until such time, the policy set forth in the Memoranda to All State Directors I-62, I-91, I-99 and I-150 remains in force.

LEWIS B. HERSHEY, Director.

All students holding letters of acceptance from deans for admission to dental and veterinary colleges and all students in good academic standing in these colleges should present letters or have letters presented for them by their deans to their local boards of the Selective Service System. All premedical students who have letters of acceptance from deans for admission to medical colleges but who have not actually matriculated should present these letters. This step is necessary in order to be considered for deferment in class II-A as a medical, dental or veterinary student. If local boards classify such students in class I-A, they should immediately notify their deans and, if necessary, exercise rights of appeal to their local boards of appeals. If after exhausting such rights of appeal, further consideration is necessary, request for further appeal may be made to the state directors and if necessary to the national director of the Selective Service System. These officers have the power to take appeals to the President.

On January 28, 1942, the following memorandum (I-363) was released by the Director of Selective Service to all state directors of the Selective Service System.

OCCUPATIONAL DEFERMENTS OF MEDICAL DOCTORS, DENTISTS AND DOCTORS OF VETERINARY MEDICINE

Information previously distributed by this headquarters clearly indicates an overall shortage of medical doctors, dentists and doctors of veterinary medicine in the nation. Since war was declared, the shortage of these professional men has become acute. It is now manifest that every qualified doctor, dentist and veterinarian must serve where he can render the greatest professional service to the nation.

In order to accomplish this purpose, the President, by Executive Order, has formed the Procurement and Assignment Service, under the Office of Defense Health and Welfare Services. This Service was formed primarily for the purpose of gathering and making available information with respect to the supply of qualified practitioners in the fields of medicine, dentistry and veterinary medicine, with a view of securing the most effective allocation of medical manpower as indicated by the requirements of the armed forces, civilian needs and industrial medicine.

To work with the headquarters of this Service in Washington, there is being organized a committee for each Corps Area in the Continental United States. Each committee will consist of five doctors, two dentists and one veterinarian. The committees have been accepted as advisers to the nine Corps Area Surgeons, to the Naval District Surgeons and to the Regional Medical Officers of the

Office of Civilian Defense and will operate not only through the subdivisions of the medical, dental and veterinary association but also with the profession at large in securing information and giving advice.

When considering the classification of any registrant who is a qualified medical doctor, dentist, or doctor of veterinary medicine, the Director of Selective Service desires that local boards, through the State Director, shall consult the Procurement and Assignment Committee of the Corps Area for information as to the availability of qualified medical doctors, dentists and doctors of veterinary medicine in the community. This information shall be considered by the local board in determining the registrant's classification. The Executive Order referred to in no way affects the authority of the Selective Service System to classify registrants. The procedure has been established for the purpose of making such information available to local boards.

For the convenience of the State Director and the local boards, the names and addresses of the Chairmen of the Nine Corps area committees of the Procurement and Assignment Service are listed:

First Corps Area: Dr. W. G. Phippen, Salem, Mass.

Second Corps Area: Dr. A. W. Booth, Elmira, N. Y.

Third Corps Area: Dr. A. M. Shipley, Baltimore, Md.

Fourth Corps Area: Dr. Edgar H. Greene, Atlanta, Ga.

Fifth Corps Area: Dr. E. L. Henderson, Louisville, Ky.

Sixth Corps Area: Dr. Charles H. Phifer, Chicago, Ill.

Seventh Corps Area: Dr. Roy W. Fouts, Omaha, Neb.

Eighth Corps Area: Dr. Sam E. Thompson, Kerrville, Texas.

Ninth Corps Area: Dr. Charles A. Dukes, Oakland, Calif.

LEWIS B. HERSHEY, Director.

DEFERMENT FOR STUDENTS

The Secretary of the Navy recently approved a change in Navy regulations whereby it is now possible for persons who have been accepted for entrance in the next entering class and all medical students in class A medical colleges and approved dental colleges to be appointed in the United States Naval Reserve with the commission Ensign H-V (P), provided they meet the physical and other requirements for such appointment. It should be noted that this applies not only for persons holding letters of acceptance and freshmen and sophomore students in these medical and dental schools but also juniors and seniors.

The Secretary of War has recently approved a change in Army Regulations which authorizes the commission as Second Lieutenant, Medical Administrative Corps, Army of the United States, of all students in class A medical colleges and to those persons who have matriculated in these colleges, provided they meet the physical and other requirements for such appointment. It should be noted that this opportunity includes freshmen and sophomores as well as juniors and seniors.

For commission in the Navy, application forms may be obtained from the dean's office or from some one designated by him, or from the commandant of the naval district in which the applicant resides. Further information may be obtained from the office of the commandant of any naval district.

For commission in the Army, applications should be made through the office of the dean to the corps area surgeon of the corps area in which the applicant resides.

Students of the Medical Reserve Officers' Training Corps should continue as before, with a view of obtaining commissions as First Lieutenant, Medical Reserve Corps, on graduation.

Students who hold commissions come under the jurisdiction of the Army and Navy authorities and are not subject to induction under the Selective Service acts. The Army and Navy authorities will defer calling these officers to active duty until they have completed their medical education.

All students who are disqualified physically for commissions should apply for deferment in accordance with the instructions already referred to.

RECENT GRADUATES

After successful completion of his medical college course every individual holding commission as Second Lieutenant, Medical Administrative Corps,

Army of the United States, should make immediate application to the Adjutant General, United States Army, Washington, D. C., for appointment as First Lieutenant, Medical or Dental Corps, Army of the United States. Every individual holding commission as Ensign H-V (P), U. S. Naval Reserve, should make immediate application to the commandant of his naval district for commission as Lieutenant (j. g.), Medical or Dental Corps Reserve, U. S. Navy. If appointment is desired in the grade of lieutenant (j. g.) in the regular Medical Corps or Dental Corps of the U. S. Navy, application should be made to the Bureau of Medicine and Surgery, Navy Department, Washington, D.C.

The Public Health Service contacts senior and junior medical students for the purpose of interesting the students in applying for positions as interns, following the successful completion of the school year. In addition the students that are accepted are offered commissions in the reserve, to be inactive during the period of their internship and to become active following the successful completion of their internship.

TWELVE MONTHS INTERNS

All interns should apply for commissions as First Lieutenant, Medical or Dental Corps, Army of the United States, or as Lieutenant (j. g.), United States Navy or Naval Reserve. After completion of twelve months' internship, except in rare instances in which the necessity of continuation as a member of the staff or as a resident can be defended by the institution, all who are physically fit may be required to enter military service. Those commissioned may then expect to enter military service in their professional capacity as medical or dental officers.

HOSPITAL STAFF MEMBERS

Interns with more than twelve months of internship, assistant residents, fellows, residents, junior staff members and staff members under the age of 45 fall within the provisions of the Selective Service acts.

All such men holding Army commissions are subject to call at any time. Temporary deferment is possible if an application made by the institution to the Adjutant General of the United States Army certifying that the individual is temporarily indispensable is approved.

All such men holding Naval Reserve commissions are subject to call at any time, at the discretion of the Secretary of the Navy. Temporary deferments are granted only on approval of applications made by the institution to the Surgeon General of the Navy.

THOSE UNDER 45

All male physicians, dentists or veterinarians under 45 are liable for military service. That their services may be utilized in a professional capacity as officers, they should be made available through the facilities of the Procurement and Assignment Service. Wherever possible, their present positions in civil life should be filled or provisions made for filling their positions, if necessary, by *(a)* those who are over 45, *(b)* those under 45 who are physically disqualified for military service, *(c)* women and *(d)* instructors and those engaged in research who do not possess M.D., D.D.S. or D.V.M. degrees but whose utilization would make available physicians, dentists or veterinarians for military service.

THOSE OVER 45

All physicians, dentists or veterinarians over 45 should enroll with the Procurement and Assignment Service. Every possible effort will be made to retain those who are essential in their present capacities. Those who are available for assignment to military, governmental, industrial or civil agencies may be asked by the Procurement and Assignment Service to serve those agencies.

MAINTAINING EDUCATIONAL, INDUSTRIAL AND CIVILIAN MEDICAL, DENTAL AND VETERINARY SERVICES

Faculties of Schools.—Authorities in medical, dental and veterinary schools

have forwarded lists to the Procurement and Assignment Service containing the names of members of their faculties who are considered essential to a proper continuation of medical, dental and veterinary education. These lists will be consulted in determining those who are considered essential. Should the status of any individual listed as essential for teaching be changed, the Procurement and Assignment Service should be immediately notified by the college authorities.

Research.—The burden of proof as to the essential character of research set forth as a reason for deferment rests on the individual and the employing institution. Efforts will be made to maintain without interruption the progress of scientific research, particularly that related to the war effort.

Civil Practice.—The Procurement and Assignment Service will do its utmost to maintain a supply of medical, dental and veterinary services for all industrial and civilian needs. Already the state and county medical, dental and veterinary societies, under the direction of state chairmen, are assembling lists of physicians, dentists and veterinarians considered essential in the positions they now occupy.

ADVISORY COMMITTEES AND LIAISON OFFICERS

On recommendations of the Directing Board of the Procurement and Assignment Service, the Office of Defense, Health and Welfare Services has appointed the following advisory committees and consultants to the Procurement and Assignment Service: Dentistry, Veterinary Medicine, Hospitals, Women Physicians, Industrial Health and Medicine, Medical Education, Negro Physicians and Public Health.

These committees are advisory to the Directing Board in establishing policies regarding the availability and utilization of personnel in their respective fields.

THE COMMITTEE ON INFORMATION

With its consultants, the Committee on Information is charged with disseminating information to all physicians, dentists and veterinarians and to the public in order that they may be kept informed of the progress of the Procurement and Assignment Service, and in order to secure their cooperation in its activities (appendix 1).

LIAISON OFFICERS

Each of the governmental agencies utilizing the services of physicians, dentists and veterinarians has appointed a liaison officer to advise and assist the Procurement and Assignment Service (appendix 1).

SPECIAL INFORMATION

Specialization.—In general, determination as to special qualifications of persons entering the medical services of the Army and Navy depends on the classification of specialists by advisory committees established through the Division of Medical Sciences of the National Research Council and certifications of boards in the various specialties. Moreover, the recommendations of state and county committees and the statements of the individuals on questionnaires will be taken into consideration. On questions of dental and veterinary specialization, the official organization will be consulted.

Citizenship.—Regulations of the United States Army and Navy do not permit the commissioning of officers who are not citizens of the United States. A commission in the United States Navy requires full citizenship for a period of ten years, and the ten year period to have been spent in the United States. Similarly, all federal agencies utilizing physicians, dentists and veterinarians now demand citizenship as a prerequisite to such enrolment.

Persons who do not possess full citizenship papers but who have been licensed to practice in any of the states of the United States should enroll with the Procurement and Assignment Service so that their services may be utilized when the opportunity arises. They should, however, do their utmost to continue in their efforts to secure citizenship to enable them to qualify for

positions that they are not able to fill because of lack of these essentials.

Physicians, dentists or veterinarians who have their first citizenship papers but who do not have a license to practice and who are under the age of 45 come within the provisions of the Selective Service acts and may be inducted in the capacity of enlisted men. When this occurs, these should make known their special capacities, so that their services may be utilized to the fullest extent in the medical departments of the Army and Navy in an enlisted capacity.

College Qualifications.—Commissions in the medical departments of the United States Army and Navy and in federal agencies are granted only to graduates of schools recognized by such agencies. For physicians, twelve months of internship or its equivalent is required.

Those wishing further information concerning the qualifications necessary to appear for examination leading to a commission in the Army or Navy or to service with any other governmental service should apply directly to such agency.

Women Physicians, Dentists and Veterinarians. — The United States Army and Navy do not permit the commissioning of women physicians, dentists or veterinarians. However, all should enroll with the Procurement and Assignment Service so that they may be recommended to such positions as are available in other federal agencies, industry or civilian capacities in which their services may be required.

The needs will no doubt be particularly acute in local, state and national institutions, in teaching and staff positions and in special occupations with the Office of Civilian Defense in the care of women and children under emergency conditions.

APPENDIX I. — PROCUREMENT AND ASSIGNMENT SERVICE.—CENTRAL ORGANIZATION

OFFICE OF DEFENSE HEALTH AND WELFARE SERVICES

DIRECTING BOARD

Dr. Frank H. Lahey, Chairman, President, American Medical Association, 605 Commonwealth Avenue, Boston.

Dr. Harvey B. Stone, Vice Chairman, Associate Professor of Surgery, Johns Hopkins University School of Medicine, 18 West Franklin Street, Baltimore.

Dr. C. Willard Camalier, Chairman, Dental Preparedness Committee, American Dental Association, 1726 Eye Street N.W., Washington, D. C.

Dr. Harold S. Diehl, Dean of Medical Sciences, University of Minnesota, Minneapolis.

Dr. James E. Paullin, 384 Peachtree Street N.E., Atlanta, Ga.

Dr. Sam F. Seeley, Executive Officer.

LIAISON OFFICERS

Major Paul A. Paden, M. C., Office of the Surgeon General, War Department, Room 1113-B, 1818 H Street N.W., Washington, D. C.

Commander Thomas B. Magath, Medical Officers Reserve Section, U. S. Navy, Washington, D. C.

Dr. Paul M. Stewart, U. S. Public Health Service, 23d and Constitution Avenue N.W., Washington, D. C.

Lieut. Col. Richard H. Eanes, M. C., Selective Service System, Potomac Park Apartment, 21st and C streets, N.W., Washington, D. C.

Dr. Hugo Mella, Veterans Administration, Washington, D. C.

Dr. George Baehr, Chief Medical Officer, Office of Civilian Defense, DuPont Circle Building, Washington, D. C. Tel. Republic 5050, Ext. 505.

Dr. Edwin F. Daily, Director, Division of Health Services, Children's Bureau, Department of Labor, Washington, D. C.

Dr. Verne K. Harvey, U. S. Civil Service Commission, Washington, D. C.

ADVISORY COMMITTEES

DENTISTRY

Dr. John T. O'Rourke, Chairman, Dean of Dental School, University of Louisville, Ky.

Dr. Leroy M. S. Miner, Vice Chairman, Dean of Dental School, Harvard University, Boston.

Dr. Frederick B. Noyes, 55 E. Washington Street, Chicago.

Dr. Guy S. Millberry, R. F. D. No. 2, Box 181, Los Gatos, Calif.

Dr. B. K. Westfall, 1006 Hume-Mansur Building, Indianapolis.

CONSULTANT

Dr. Gerald D. Timmons, Executive Secretary, American Dental Association, 212 East Superior Street, Chicago.

HOSPITALS

Dr. Winford H. Smith, Chairman, Director, Johns Hopkins Hospital, Baltimore.

Dr. Nathaniel W. Faxon, Vice Chairman, Director, Massachusetts General Hospital, Boston.

Dr. Claude W. Munger, Director, St. Luke's Hospital, 421 W. 113th Street, New York.

Dr. M. T. MacEachern, Associate Director, American College of Surgeons, 40 East Erie Street, Chicago.

Rev. Fr. Alphonse M. Schwitalla, Dean, St. Louis University School of Medicine, 1402 South Grand Boulevard, St. Louis.

INDUSTRIAL HEALTH AND MEDICINE

Dr. C. D. Selby, Chairman, Medical Director, General Motors Corporation, Detroit.

Dr. A. J. Lanza, Vice Chairman, Assistant Medical Director, Metropolitan Life Insurance Company, 1 Madison Avenue, New York.

Mr. William Yant, Director of Research and De-

velopment, Mine Safety Appliance Company, Braddock, Thomas & Meade Streets, Pittsburgh.

Dr. Lloyd Noland, Chief Surgeon, Tennessee Coal, Iron and Railroad Company, Fairfield, Ala.

Dr. E. C. Holmblad, 28 East Jackson Boulevard, Chicago.

Professor Philip Drinker, Department of Industrial Hygiene, School of Public Health, Harvard University, 55 Shattuck Street, Boston.

Dr. George M. Smith, Department of Anatomy, Yale University School of Medicine, New Haven, Conn.

MEDICAL EDUCATION

Dr. C. Sidney Burwell, Chairman, Dean, Harvard University Medical School, 25 Shattuck Street, Boston.

Dr. William S. Middleton, Vice Chairman, Dean of Medical School, University of Wisconsin, 1300 University Avenue, Madison, Wis.

Dr. Willard C. Rappleye, Dean, College of Physicians and Surgeons, Columbia University, 630 West 168th Street, New York.

Dr. John H. Musser, Professor of Medicine, Tulane University School of Medicine, 1430 Tulane Avenue, New Orleans.

Dr. Loren R. Chandler, Dean, School of Medicine, Stanford University, San Francisco.

NEGRO HEALTH

Dr. M. O. Bousfield, Chairman, Director of Negro Health, Julius Rosenwald Fund, 4901 Ellis Avenue, Chicago.

Dr. Russell A. Dixon, Vice Chairman, Dean, College of Dentistry, Howard University, Washington, D. C.

Dr. G. Hamilton Francis, 1024 East Liberty Street, Norfolk, Va.

Mr. A. W. Dent, Superintendent, Flint Goodridge Hospital, New Orleans.

Dr. A. N. Vaughn, Surgeon, Homer G. Philips Hospital, St. Louis.

PUBLIC HEALTH

Dr. Carl V. Reynolds, Chairman, 216 West Jones Street, Raleigh, N. C.

Dr. Harry S. Mustard, Vice Chairman, DeLamar Institute of Public Health, 600 West 168th Street, New York.

Dr. Gaylord West Anderson, University of Minnesota, Minneapolis.

Dr. Waller S. Leathers, School of Medicine, Vanderbilt University, Nashville, Tenn.

Dr. John L. Rice, 125 Worth Street, New York.

VETERINARY MEDICINE

Dr. John G. Hardenbergh, Chairman, Executive Secretary, American Veterinary Medical Association, 600 South Michigan Avenue, Chicago.

Dr. John R. Mohler, Vice Chairman, Chief, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C.

Dr. Harry W. Jakeman, President, American Veterinary Medical Association, 44 Bromfield Street, Boston.

Dr. William A. Hagan, Dean, New York State Veterinary College, Cornell University, Ithaca, N. Y.

Dr. Cassius Way, 25 Vanderbilt Avenue, New York.

WOMAN PHYSICIANS

Dr. Sara Murray Jordan, Chairman, 605 Commonwealth Avenue, Boston.

Dr. Margaret D. Craighill, Vice Chairman, Dean, Woman's Medical College of Pennsylvania, East Falls, Philadelphia.

Dr. Ruth Evelyn Boynton, University of Minnesota, Minneapolis.

Dr. Ada Chree Reid, Executive Secretary, American Medical Women's Association, 102 E. 22d Street, New York.

Dr. Irma Jackson, Forest Hills Inn, Forest Hills, N. Y.

INFORMATION

Dr. Morris Fishbein, Chairman, Editor, Journal American Medical Association, 535 North Dearborn Street, Chicago.

Dr. Ira V. Hiscock, Vice Chairman, Yale University School of Medicine, New Haven, Conn.

Mr. J. J. Bloomfield, Sanitary Engineer, U. S. Public Health Service, National Institute of Health, Bethesda, Md.

Dr. John F. Fulton, Yale University School of Medicine, 333 Cedar Street, New Haven, Conn.

Dr. Richard M. Hewitt, Mayo Clinic, Rochester, Minn.

Dr. Sanford V. Larkey, Division of Medical Sciences, National Research Council, 2101 Constitution Avenue, Washington, D. C.

Dr. Robert N. Nye, Managing Editor, New England Journal of Medicine, 8 Fenway, Boston.

CONSULTANTS

Mr. Watson Davis, 1719 N Street N.W., Washington, D. C.

Mr. David Dietz, Science Editor, Scripps-Howard Newspapers, United Press, Cleveland Press Building, Cleveland.

Mr. William Laurence, New York Times, New York.

Mr. Arthur T. Robb, Editor of Editor and Publisher, 1475 Broadway, New York.

Dr. Gerald D. Timmons, Executive Secretary, American Dental Association, 212 East Superior Street, Chicago.

Dr. John G. Hardenbergh, Executive Secretary, American Veterinary Medical Association, 600 South Michigan Avenue, Chicago.

APPENDIX 2—REGIONAL ORGANIZATIONS

FIRST CORPS AREA

CORPS AREA COMMITTEE

Chairman.—Dr. W. G. Phippen, 31 Chestnut Street, Salem, Mass.

Physicians.—Dr. Deering G. Smith, 77 Main Street, Nashua, N. H.; Dr. Lucius C. Kingman, 76 Waterman Street, Providence, R. I.

Dentist.—Dr. Philip E. Adams, 106 Marlboro Street, Boston.

Veterinarian.—Dr. R. W. Smith, Concord, N. H.

Hospital Representative.—Dr. Nathaniel W. Faxon, Massachusetts General Hospital, Boston.

Medical Education Representative.—Dr. C. Sidney Burwell, 25 Shattuck Street, Boston.

STATE CHAIRMEN IN FIRST CORPS AREA

CONNECTICUT

Medical.—Dr. Creighton Barker, 258 Church Street, New Haven.

Dental.—Dr. Louis R. Siegal, 750 Main Street, Hartford.

Veterinary Medical.—Dr. Edwin Laitinen, 993 N. Main Street, West Hartford.

MAINE

Medical.—Dr. John G. Towne, 135 Main Street, Waterville.

Dental.—Dr. Giles C. Grant, 655 Congress Street, Portland.

Veterinary Medical.—Dr. P. R. Baird, 52 Pleasant Street, Waterville.

MASSACHUSETTS

Medical.—Dr. Reginald Fitz, 319 Longwood Avenue, Boston.

Dental.—Dr. Andrew J. Rafferty, 390 Main Street, Worcester.

Veterinary Medical.—Dr. Harrie W. Peirce, 100 Nashua Street, Boston.

NEW HAMPSHIRE

Medical.—Dr. Deering G. Smith, 77 Main Street, Nashua.

Dental.—Dr. William H. Putney, 85 Pleasant Street, Concord.

Veterinary Medical.—Dr. R. W. Smith, State House, Concord.

RHODE ISLAND

Medical.—Dr. Halsey DeWolf, 199 Thayer Street, Providence.

Dental.—Dr. E. C. Elliott, 615 Union Trust Bldg., Providence.

Veterinary Medical.—Dr. J. S. Barber, 560 Pleasant Street, Pawtucket.

VERMONT

Medical.—Dr. Benjamin F. Cook, 46 Nichols Street, Rutland.

Dental.—Dr. Maxwell L. Jameson, 69 Pine Street, Burlington.

Veterinary Medical.—Dr. A. A. Mortimer, 27 Central Street, Randolph.

SECOND CORPS AREA

CORPS AREA COMMITTEE

Chairman.—Dr. A. W. Booth, 222 West Church Street, Elmira, N. Y.

Physicians.—Dr. Samuel J. Kopetzky, 71 East 80th Street, New York; Dr. W. J. Carrington, 905 Pacific Avenue, Atlantic City, N. J.

Dentists.—Dr. William McG. Burns, 80 Hanson Place, Brooklyn; Dr. Allen T. Newman, 209 East 23d Street, New York.

Veterinarian.—Dr. R. R. Birch, Route 2, Ithaca, N. Y.

Hospital Representative.—Dr. Claude W. Munger, St. Luke's Hospital, New York.

Medical Education Representative.—Dr. Willard C. Rappleye, Columbia University Medical School, New York.

STATE CHAIRMEN IN SECOND CORPS AREA

DELAWARE

Medical.—Dr. William H. Speer, 917 Washington Street, Wilmington.

Dental.—Dr. William Stewart, Medical Arts Building, Wilmington.

Veterinary Medical.—Dr. Harry McDaniel Jr., State Board of Agriculture, Dover.

NEW JERSEY

Medical.—Dr. Charles H. Schlichter, 143 E. State Street, Trenton.

Dental.—Dr. E. C. Stillwell, 815 Bloomfield, Glen Ridge.

Veterinary Medical.—Dr. A. W. Smith, 8 Longview Road, Livingston.

NEW YORK

Medical.—Dr. Samuel J. Kopetzky, 71 E. 80th Street, New York.

Dental.—Dr. William McG. Burns, 80 Hanson Place, Brooklyn.

Veterinary Medical.—Dr. Albert L. Brown, Route 1, Adams.

THIRD CORPS AREA

CORPS AREA COMMITTEE

Chairman.—Dr. A. M. Shipley, University Hospital, Baltimore.

Physicians.—Dr. C. H. Henninger, 500 Penn Avenue, Pittsburgh; Dr. Hugh H. Trout, 1301 Franklin Road, Roanoke, Va.

Dentists.—Dr. B. Lucien Brun, 827 Park Avenue, Baltimore; Dr. Harry Bear, 410 Professional Bldg., Richmond, Va.

Veterinarian.—Dr. Mark Welsh, College Park, Md.

Hospital Representative.—Dr. Winford H. Smith, Johns Hopkins Hospital, Baltimore.

Medical Education Representative.—Dr. William Pepper, University of Pennsylvania School of Medicine, Philadelphia.

STATE CHAIRMEN IN THIRD CORPS AREA

MARYLAND

Medical.—Dr. Charles W. Maxson, 827 N. Charles Street, Baltimore.

Dental.—Dr. T. J. Bland, Medical Arts Building, Baltimore.

Veterinary Medical.—Dr. A. L. Brueckner, College Park.

PENNSYLVANIA

Medical.—Dr. Charles H. Henninger, 500 Penn Avenue, Pittsburgh.

Dental.—Dr. R. H. Nones, 1930 Chestnut Street, Philadelphia.

Veterinary Medical.—Dr. Ernest W. Hogg, 20 Darling Street, Wilkes-Barre.

VIRGINIA

Medical.—Dr. Hugh H. Trout, 1301 Franklin Road, Roanoke.

Dental.—Dr. J. H. John, Medical Arts Bldg., Roanoke.

Veterinary Medical.—Dr. I. D. Wilson, Polytechnic Institute, Blacksburg.

DISTRICT OF COLUMBIA

Medical.—Dr. Francis X. McGovern, 1835 Eye Street N.W., Washington, D. C.

Dental.—Dr. George Albert Smith, 1835 Eye Street N.W., Washington, D. C.

Veterinary Medical.—Dr. A. E. Wight, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C.

FOURTH CORPS AREA

CORPS AREA COMMITTEE

Chairman.—Dr. Edgar H. Greene, 478 Peachtree Street N.E., Atlanta, Ga.

Physicians.—Dr. Alfred A. Walker, 2250 Highland Avenue, Birmingham, Ala.; Dr. Edward H. Jelks, P. O. Box 1018, Jacksonville, Fla.

Dentists.—Dr. Claude R. Wood, 606 Medical Arts Building, Knoxville, Tenn.; Dr. Ralph R. Byrnes, 106 Forest Avenue N.E., Atlanta, Ga.

Veterinarian.—Dr. B. T. Simms, Regional Animal Disease Research Laboratory, Auburn, Ala.

Hospital Representative.—Dr. J. Moss Beeler, Grady Hospital, Atlanta, Ga.

Medical Education Representative.—Dr. R. H. Oppenheimer, 50 Armstrong Street, Atlanta, Ga.

STATE CHAIRMEN IN FOURTH CORPS AREA

ALABAMA

Medical.—Dr. B. F. Austin, 519 Dexter Avenue, Montgomery.

Dental.—Dr. C. B. Bray, American Cast Iron Pipe Company, Birmingham.

Veterinary Medical.—Dr. R. S. Sugg, School of Veterinary Medicine Alabama Polytechnic Institute, University.

FLORIDA

Medical.—Dr. Edward Jelks, Box 1018, Jacksonville.
Dental.—Dr. E. C. Lunsford, 126 W. San Marius, Miami.
Veterinary Medical.—Dr. J. L. Ruble, 1600 N. Orange Ave., Orlando.

GEORGIA

Medical.—Dr. Edgar H. Greene, 478 Peachtree Street N.E., Atlanta.
Dental.—Dr. R. H. Murphy, 920 Persons Building, Macon.
Veterinary Medical.—Dr. J. M. Sutton, Sylvester.

LOUISIANA

Medical.—Dr. C. Grenes Cole, 921 Canal Street, New Orleans.
Dental.—Dr. Larry J. Dupuy, 837 Maison Blanche Building, New Orleans.
Veterinary Medical.—Dr. E. P.. Flower, Box 24, Baton Rouge.

MISSISSIPPI

Medical.—Dr. T. M. Dye, Box 295, Clarksdale.
Dental.—Dr. George P. Evans, Standard Life Building, Jackson.
Veterinary Medical.—Dr. E. S. Brashier, State Vet. & Exec. Off., Mississippi State Live Stock San. Bd., Jackson.

NORTH CAROLINA

Medical.—Dr. Hubert B. Haywood, 127 W. Hargett Street, Raleigh.
Dental.—Dr. H. O. Lineberger, 804 Professional Building, Raleigh.
Veterinary Medical.—Dr. William Moore, State Veterinarian, Raleigh.

SOUTH CAROLINA

Medical.—Dr. W. L. Pressly, Due West.
Dental.—Dr. E. W. Sheperd, Spartanburg.
Veterinary Medical.—Dr. R. A. Mays, J. C. Calhoun State Office Building, Columbia.

TENNESSEE

Medical.—Dr. W. C. Dixon, 706 Church Street, Nashville.
Dental.—Dr. Lawrence T. Kennedy, Medical Arts Building, Knoxville.
Veterinary Medical.—Dr. M. Jacob, University of Tennessee, Knoxville.

FIFTH CORPS AREA

CORPS AREA COMMITTEE

Chairman.—Dr. E. L. Henderson, 606 S. 4th Street, Louisville, Ky.
Physicians.—Dr. Robert Conard, Hartman Theater Building, Columbus, Ohio; Dr. Larue D. Carter, 1820 E. 10th Street, Indianapolis.
Dentists.—Dr. Earl D. Lowry, 79 E. State Street, Columbus, Ohio; Dr. Wendell D. Postle, 1714 N. High Street, Columbus, Ohio.
Veterinarian.—Dr. A. F. Schalk, Ohio State University, Columbus, Ohio.
Hospital Representative.—Dr. Robert H. Bishop, 2065 Adelbert Road, Cleveland.
Medical Education Representative.—Dr. Hardy A. Kemp, Ohio State University Medical School, Columbus, Ohio.

STATE CHAIRMEN IN FIFTH CORPS AREA

INDIANA

Medical.—Dr. Charles R. Bird, 23 E. Ohio Street, Indianapolis.
Dental.—Dr. H. T. Berkey, Wayne Pharmacal Building, Fort Wayne.
Veterinary Medical.—Dr. Charles C. Dobson, New Augusta.

KENTUCKY

Medical.—Dr. Arthur T. McCormack, 620 S. 3d Street, Louisville.
Dental.—Dr. E. C. Hume, Heyburn Building, Louisville.
Veterinary Medical.—Dr. Arthur J. Kay, 517 Murray Street, Frankfort.

OHIO

Medical.—Dr. Robert Conard, Hartman Theater Building, Columbus.
Dental.—Dr. Frank C. Starr, 150 E. Broad Street, Columbus.
Veterinary Medical.—Dr. D. C. Hyde, 1700 Arlington Avenue, Columbus.

WEST VIRGINIA

Medical.—Dr. R. H. Walker, 240 Capitol Street, Charleston.
Dental.—Dr. Ira J. Kail, 1018 First National Bank Bldg., Huntington.
Veterinary Medical.—Dr. H. M. Newton, P. O. Box 1721, Charleston.

SIXTH CORPS AREA

CORPS AREA COMMITTEE

Chairman.—Dr. Charles H. Phifer, 30 North Michigan Avenue, Chicago.
Physicians.—Dr. P. R. Urmston, 916 Washington Avenue, Bay City, Mich.; Dr. Stephen E. Gavin, 104 South Main Street, Fond du Lac, Wis.
Dentists.—Dr. Leo Kremer, 55 East Washington Street, Chicago; Dr. Paul H. Jeserich, W. K. Kellogg Institute, Ann Arbor, Mich.
Veterinarian.—Dr. Ward Giltner, Michigan State College, East Lansing, Mich.
Hospital Representative.—Mr. Joseph G. Norby, Columbia Hospital, Milwaukee.
Medical Education Representative.—Dr. A. C. Bachmeyer, 950 East 59th Street, Chicago.

STATE CHAIRMEN IN SIXTH CORPS AREA

ILLINOIS

Medical.—Dr. Harold M. Camp, 2245 South Main Street, Monmouth.
Dental.—Dr. William I. McNeil, 59 East Madison Street, Chicago.
Veterinary Medical.—Dr. A. E. Bott, 1317 Pennsylvania Ave., East St. Louis.

MICHIGAN

Medical.—Dr. P. R. Urmston, 916 Wash. Avenue, Bay City.
Dental.—Dr. J. O. Goodsell, 2nd Nat. Bank Building, Saginaw.
Veterinary Medical.—Dr. B. J. Killham, Michigan State College, East Lansing.

WISCONSIN

Medical.—Dr. R. E. Fitzgerald, 2750 North Teutonia Avenue, Milwaukee.
Dental.—Dr. Charles J. Baumann, 408 West Greenfield Avenue, Milwaukee.
Veterinary Medical.—Dr. W. Wisnicky, University of Wisconsin, Madison.

SEVENTH CORPS AREA

CORPS AREA COMMITTEE

Chairman.—Dr. Roy W. Fouts, 107 South 17th Street, Omaha.
Physicians.—Dr. F. L. Loveland, 109 West 9th Street, Topeka, Kan.; Dr. Robert L. Parker, 3510 6th Avenue, Des Moines, Iowa.
Dentists.—Dr. F. A. Pierson, 1112 Federal Security Building, Lincoln, Neb.; Dr. A. W. Bryan, Box 727, Iowa City.
Veterinarian.—Dr. H. D. Bergman, Iowa State College, Ames, Iowa.

Hospital Representative.—Mr. Robert E. Neff, University Hospital, Iowa City.
Medical Education Representative.—Dr. C. W. N. Poynter, 42d Street and Dewey Avenue, Omaha.

STATE CHAIRMEN IN SEVENTH CORPS AREA

ARKANSAS

Medical.—Dr. W. R. Brooksher, 602 Garrison Avenue, Fort Smith.
Dental.—Dr. I. M. Sternberg, 1st National Bank Building, Fort Smith.
Veterinary Medical.—Dr. Joe S. Campbell, Route 4, Little Rock.

IOWA

Medical.—Dr. T. F. Suchomel, 305 2d Street, Cedar Rapids.
Dental.—Dr. John Voss, Voss Building, Iowa City.
Veterinary Medical.—Dr. A. R. Menary, 1721 Blake Boulevard, Cedar Rapids.

KANSAS

Medical.—Dr. F. L. Loveland, 109 West 9th Street, Topeka.
Dental.—Dr. John W. Richmond, Huron Building, Kansas City.
Veterinary Medical.—Dr. R. R. Dykstra, Kansas State College, Manhattan.

MINNESOTA

Medical.—Dr. William F. Braasch, 102 2d Street, Rochester.
Dental.—Dr. J. P. Werrick, Medical Arts Building, Minneapolis.
Veterinary Medical.—Dr. C. E. Cotton, 3145 Portland Avenue, Minneapolis.

MISSOURI

Medical.—Dr. Robert Mueller, 3115 South Grand Avenue, St. Louis.
Dental.—Dr. R. J. Rinehart, K. C. Western Dental College, Kansas City.
Veterinary Medical.—Dr. S. W. Haigler, 7645 Delmar Boulevard, St. Louis.

NEBRASKA

Medical.—Dr. A. A. Conrad, Crete.
Dental.—Dr. Lawrence A. Donahoe, 1128 City National Bank Building, Omaha.
Veterinary Medical.—Dr. W. T. Spencer, Livestock Exchange Building, Omaha.

NORTH DAKOTA

Medical.—Dr. L. W. Larson, 221 5th Street, Bismarck.
Dental.—Dr. A. O. Schjeldahl, 523½ 5th Avenue, Valley City.
Veterinary Medical.—Dr. R. E. Shigley, 710 2d Street S.E., Minot.

SOUTH DAKOTA

Medical.—Dr. William Duncan, Webster.
Dental.—Dr. R. W. Ellis, Salem.
Veterinary Medical.—Dr. D. L. Cotton, Beresford.

WYOMING

Medical.—Dr. George H. Phelps, 1606 Capitol Avenue, Cheyenne.
Dental.—Dr. L. C. Hunt, 308 West 3d Avenue, Cheyenne.
Veterinary Medical.—Dr. H. D. Port, 304 Capitol Building, Cheyenne.

EIGHTH CORPS AREA

CORPS AREA COMMITTEE

Chairman.—Dr. Sam E. Thompson, Kerrville, Texas.
Physicians.—Dr. Holman Taylor, 1404 West El Paso Street, Fort Worth Texas; Dr. John W. Amesse, 227 16th Street, Denver.
Dentists.—Dr. T. G. Duckworth, 915 Medical Arts Building, San Antonio, Texas; Dr. Fred C. Elliott, 1018 Blodgett Avenue, Houston, Texas.
Veterinarian.—Dr. M. B. Starnes, City Health Department, Dallas, Texas.
Hospital Representative.—Mr. Frank Walter, St. Luke's Hospital, Denver.
Medical Education Representative.—Dr. Maurice H. Rees, 4200 East 9th Avenue, Denver.

STATE CHAIRMEN IN EIGHTH CORPS AREA

ARIZONA

Medical.—Dr. Charles S. Smith, Nogales.
Dental.—Dr. W. A. Baker, Professional Building, Phoenix.
Veterinary Medical.—Dr. T. B. Jones, 105 Capitol Building, Phoenix.

COLORADO

Medical.—Dr. John W. Amesse, 227 16th Street, Denver.
Dental.—Dr. E. M. Silverberg, 809 Republic Building, Denver.
Veterinary Medical.—Dr. Floyd Cross, Colorado State College, Fort Collins.

NEW MEXICO

Medical.—Dr. L. B. Cohenour, 221 Central Avenue, Albuquerque.
Dental.—Dr. H. R. Chapin, El Moro Building, Gallup.
Veterinary Medical.—Dr. S. W. Wiest, Box 75, Santa Fe.

OKLAHOMA

Medical.—Dr. Henry H. Turner, 1200 North Walker, Oklahoma City.
Dental.—Dr. A. C. Seids, 1200 North Walker, Oklahoma City.
Veterinary Medical.—Dr. L. J. Allen, 1610 North Ellison, Oklahoma City.

TEXAS

Medical.—Dr. Holman Taylor, 1404 West El Paso Street, Fort Worth.
Dental.—Dr. J. E. Robinson, Medical Arts Building, San Antonio.
Veterinary Medical.—Dr. T. O. Booth, 2002 W. T. Waggoner Building, Fort Worth.

NINTH CORPS AREA

CORPS AREA COMMITTEE

Chairman.—Dr. Charles A. Dukes, 426 17th Street, Oakland, Calif.
Physicians.—Dr. John H. Fitzgibbon, 812 S.W. Washington, Portland, Ore.; Dr. John M. O'Shea, 422 Riverside Avenue, Spokane, Wash.
Dentists.—Dr. B. C. Kingsbury, 490 Post Street, San Francisco; Dr. E. O. Sloman, 344 14th Street, San Francisco.
Veterinarian.—Dr. C. M. Haring, University of California, Berkeley, Calif.
Hospital Representative.—Dr. Benjamin W. Black, 2701 14th Avenue, Oakland, Calif.
Medical Education Representative.—Dr. Loren R. Chandler, Stanford University, School of Medicine, San Francisco.

STATE CHAIRMEN IN NINTH CORPS AREA

CALIFORNIA

Medical.—Dr. Harold A. Fletcher, 490 Post Street, San Francisco.
Dental.—Dr. Kenneth Ruedy, 3780 Wilshire Boulevard, Los Angeles; Dr. John W. Leggett, 490 Post Street, San Francisco.
Veterinary Medical.—Dr. Joseph M. Arburua, 26 Fell Street, San Francisco.

IDAHO

Medical.—Dr. F. M. Cole, Caldwell.
Dental.—Dr. J. E. Bennett, Idaho Falls.
Veterinary Medical.—Dr. Arthur P. Schneider, 2519 Boise Ave., Boise.

MONTANA

Medical.—Dr. Herbert T. Caraway, 115 North 28th Street, Billings.
Dental.—Dr. D. H. McCauley, 9 First Avenue, Laurel.
Veterinary Medical.—Dr. W. J. Butler, c/o Capitol Station, Helena.

NEVADA

Medical.—Dr. C. W. West, 120 North Virginia Street, Reno.
Dental.—Dr. G. C. Steinmiller, Masonic Temple, Reno.
Veterinary Medical.—Dr. Edward Records, University of Nevada, Reno.

OREGON

Medical.—Dr. Wilson Johnston, 1020 S.W. Taylor Street, Portland.
Dental.—Dr. N. L. Zimmerman, Medical Dental Building, Portland.
Veterinary Medical.—Dr. Fred W. Lange, 855 Belmont Street, Salem.

UTAH

Medical.—Dr. John F. Sharp, 75 S. Main, Salt Lake City.
Dental.—Dr. C. O. Robinson, Medical Arts Building, Salt Lake City.
Veterinary Medical.—Dr. W. H. Hendricks, 1419 East 17th South Street, Salt Lake City.

WASHINGTON

Medical.—Dr. Raymond L. Zech, 509 Olive Way, Seattle.
Dental.—Dr. L. L. Foote, Medical & Dental Building, Seattle.
Veterinary Medical.—Dr. M. O. Barnes, 203 Federal Building, Olympia.

APPENDIX 3.—ADDRESSES OF NAVAL COMMANDANTS

The addresses of commandants of the several naval districts and the limits of their jurisdiction as far as Naval Reserve is concerned are:

Commandant, 1st Naval District, North Station Office Building, 150 Causeway Street, Boston. (States of Maine, Massachusetts, New Hampshire, Vermont, and Rhode Island, including Block Island.)

Commandant, 3d Naval District, Federal Building, 90 Church Street, New York. (States of New York, Connecticut, and upper New Jersey, including counties of Mercer, Monmouth, and all counties north thereof, also Nantucket Shoals Lightship.)

Commandant, 4th Naval District, Navy Yard, Philadelphia. (States of Pennsylvania, southern part of New Jersey, including counties of Burlington, Ocean, and all counties south thereof; Delaware, including Winters Quarter Shoal Light Vessel.)

Commandant, 5th Naval District, Naval Operating Base, Norfolk, Va. (States of Maryland, except Prince Georges, Montgomery, and Charles Counties; Virginia, except Arlington, Fairfax, Stafford, King George, and Prince William Counties, and the city of Alexandria; West Virginia, and the counties of Currituck, Camden, Pasquotank, Gates, Perquimans, Chowan, Dare, Tyrrell, Washington, Hyde, Beaufort, Pamlico, Craven, Jones, Carteret and Onslow in North Carolina, also the Diamond Shoal Lightship.)

Commandant, 6th Naval District, Navy Yard, Charleston, S. C. (States of South Carolina, Georgia, and North Carolina, except the counties of Currituck, Camden, Pasquotank, Gates, Perquimans, Chowan, Dare, Tyrrell, Washington, Hyde, Beaufort Pamlico, Craven, Jones, Carteret and Onslow.)

Commandant, 7th Naval District, Naval Station, Key West, Fla. (State of Florida, except counties west of Apalachicola River.)

Commandant, 8th Naval District, Federal Building, New Orleans, La. (States of Alabama, Tennessee, Louisiana, Mississippi, Arkansas, Oklahoma, Texas, and Florida, except counties east of Apalachicola River.)

Commandant, 9th Naval District, Naval Training Station, Great Lakes, Ill. (States of Ohio, Michigan, Kentucky, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas.)

Commandant, 10th Naval District, San Juan, P. R. (All island possessions of the United States pertaining to Puerto Rico and the Virgin Islands.)

Commandant, 11th Naval District, Naval Operating Base, San Diego, Calif. (States of New Mexico, Arizona, southern part of California, including counties of Santa Barbara, Kern, and San Bernardino, and all counties south thereof.)

Commandant, 12th Naval District, 1095 Market Street, San Francisco, Calif. (States of Colorado, Utah, Nevada, northern part of California, including counties of San Luis Obispo, Kings, Inyo, and Tulare and all counties north thereof.)

Commandant, 13th Naval District, Exchange Building, Seattle, Wash. (States of Washington, Oregon, Idaho, Montana, Wyoming, and Territory of Alaska.)

Commandant, 14th Naval District, Navy Yard, Pearl Harbor, T. H. (Hawaiian Island, and islands westward, including Midway.)

Commandant, 15th Naval District, Naval Station, Balboa, C. Z. (Panama Canal Zone.)

Commandant, 16th Naval District, Naval Station, Cavite, P. I. (Philippine Islands.)

Commandant, Navy Yard, Washington, D. C. (District of Columbia, Prince Georges, Montgomery, and Charles Counties, Maryland; and Arlington, Fairfax, Stafford, King George, and Prince William Counties, Virginia, and the city of Alexandria, Va.)

COUNCIL ON DENTAL EDUCATION

THE DENTAL STUDENTS' REGISTER

THE series of statistical tables issued annually by the Council on Dental Education under the caption of the Dental Students' Register presents evidence of interesting trends in dental education and licensure. The several tables are compiled as of October 15, 1941.

Table 1 on enrollment shows a total undergraduate enrollment as of October 15, 1941 of 8,355. This is an increase of 635 over the previous year and is the largest in the last fifteen years. The increase of 635 is distributed as follows: 171 freshmen; 99 sophomores; 133 juniors; 232 seniors. The grand total of enrollment including special, graduate and postgraduate students and dental hygiene students is 8,980.

Table 2 on comparative enrollment shows the total undergraduate enrollment for the last ten years. The lowest enrollment in that time was 7,160 in 1933-1934. The largest enrollment this year in a single school is 561 and the lowest, 51. The average in the thirty-nine dental schools is 214.

Table 3 on pre-dental college training shows the pre-dental training of the 8,355 undergraduates as follows: With less than 2 years, 18 (all hold-overs); with 2 years, 4,183; with 3 years, 1,510; with 4 years without a degree, 320; with a bachelor's degree, 2,203; with other degree, 121. This table also shows the pre-dental training of the 2,476 freshmen as follows: With 2 years, 1,162; with 3 years, 526; with 4 years without a degree, 140; with a bachelor's degree, 626; with other degree, 22.

Table 4 on the pre-dental training of graduates in 1941 shows that there were 1,568 graduates for the year ending June 30, 1941 with pre-dental training as follows: With less than 2 years, 74; with 2 years, 713; with 3 years, 233; with 4 years without a degree, 41; with a bachelor's degree, 456; with other degree, 51. This was the smallest graduating class with three exceptions in the last forty-four years.

Table 5 on comparative pre-dental training of graduates from 1935 to 1941 shows an increase in seven years from 17 to 32 per cent of the graduates with pre-dental training of a bachelor's or other degree.

Table 6 on the geographic distribution of the 8,355 undergraduates shows students from every state in the union and 97 from U. S. possessions, 32 from Canada and 82 from other foreign countries. The largest enrollment is 1,819 from New York and the smallest, 4 from Nevada.

Table 7 on enrollment in schools of dental hygiene shows seventeen schools in operation (thirteen in dental schools) with an enrollment of 501.

Table 8 gives a list of the thirty-nine dental schools in the United States with the names of the deans and the opening and closing dates for the academic year 1941-1942.

Table 9 indicates that 2,476 freshmen were in attendance on October 15, 1941, and that there were 757 acceptances which were not followed by matriculation or continuance and 2,246 rejections.

The actual number of students who were accepted and did not matriculate or continue and the actual number of students who were rejected by one or more schools will be the subject of a separate document.

Table 10 gives the results of licensing examinations in 1940.

TABLE 1.—TOTAL ENROLLMENT IN THE DENTAL SCHOOLS OF THE UNITED STATES AS OF OCTOBER 15, 1941

Total Enrollment in the Dental Schools of the United States as of October 15, 1941

SCHOOL OR COLLEGE	UNDERGRADUATES								OTHER STUDENTS						ALL STUDENTS		
	Freshmen	Sophomores	Juniors	Seniors	Men	Women	Total	Dental Hygienists	Specials	Graduate	Post Grad.	Men	Women	Total	Men	Women	Total
California																	
College of Physicians & Surgeons	48	40	41	34	159	4	163	–	–	–	–	–	–	–	159	4	163
University of California	56	48	37	40	177	4	181	10	–	–	–	–	–	10	177	14	191
University of Southern California	145	105	85	50	380	5	385	6	–	7	–	7	6	13	387	11	398
District of Columbia																	
Georgetown University	66	47	44	44	201	–	201	*	–	–	–	–	–	–	201	–	201
Howard University	29	25	18	17	87	2	89	3	–	–	12	12	3	15	99	5	104
Georgia																	
Atlanta-Southern Dental College	101	103	77	70	344	7	351	–	–	1	–	1	–	1	345	7	352
Illinois																	
Loyola University, Chicago	60	86	73	55	274	–	274	–	–	7	–	7	–	7	281	–	281
Northwestern University	93	58	62	82	294	1	295	23	–	23	17	39	24	63	333	25	358
University of Illinois	58	62	56	51	224	3	227	–	–	14	–	14	–	14	238	3	241
Indiana																	
Indiana University	44	42	25	19	129	1	130	–	–	–	–	–	–	–	129	1	130
Iowa																	
State University of Iowa	40	35	40	18	133	–	133	–	–	1	–	1	–	1	134	–	134
Kentucky																	
University of Louisville	54	41	54	37	183	3	186	–	–	–	–	–	–	–	183	3	186
Louisiana																	
Loyola University, New Orleans	42	34	37	43	155	1	156	–	–	–	–	–	–	–	155	1	156
Maryland																	
University of Maryland	98	75	86	63	319	3	322	–	–	–	2	2	–	2	321	3	324
Massachusetts																	
*Harvard University	9	38	36	36	119	–	119	–	2	–	5	7	–	7	126	–	126
Tufts College	83	74	68	57	280	2	282	–	1	–	–	1	–	1	281	2	283
Michigan																	
University of Detroit	14	22	23	32	91	–	91	–	1	–	–	1	–	1	92	–	92
University of Michigan	69	39	46	32	182	4	186	35	–	27	84	109	37	146	291	41	332
Minnesota																	
University of Minnesota	82	59	59	64	262	2	264	90	–	6	–	6	90	96	268	92	360
Missouri																	
University of Kansas City	60	84	61	54	259	–	259	–	–	–	–	–	–	–	259	–	259
St. Louis University	81	57	40	58	236	–	236	–	–	–	–	–	–	–	236	–	236
Washington University	44	16	21	26	105	2	107	–	–	–	–	–	–	–	105	2	107
Nebraska																	
Creighton University	21	18	25	12	74	2	76	–	–	–	–	–	–	–	74	2	76
University of Nebraska	32	14	15	12	73	–	73	–	–	–	–	–	–	–	73	–	73
New York																	
Columbia University	51	53	54	48	202	4	206	41	1	–	19	20	41	61	222	45	267
New York University	149	148	138	126	560	1	561	–	2	–	24	26	–	26	586	1	587
University of Buffalo	50	–	42	43	135	–	135	–	–	–	–	–	–	–	135	–	135
Ohio																	
Ohio State University	57	62	65	51	234	1	235	–	–	2	8	9	1	10	243	2	245
Western Reserve University	60	36	43	33	170	2	172	–	–	–	–	–	–	–	170	2	172
Oregon																	
North Pacific College of Oregon	72	53	57	38	218	2	220	16	9	–	5	9	21	30	227	23	250
Pennsylvania																	
Temple University	121	111	92	136	452	8	460	22	–	–	–	–	22	22	452	30	482
University of Pennsylvania	121	106	88	98	410	3	413	37	3	–	–	3	37	40	413	40	453
University of Pittsburgh	96	90	74	74	327	7	334	–	–	2	9	11	–	11	338	7	345
Tennessee																	
Meharry Medical College	23	9	8	11	50	1	51	–	1	–	–	–	1	1	50	2	52
University of Tennessee	28	26	29	27	109	1	110	10	–	–	1	1	10	11	110	11	121
Texas																	
Baylor University	57	39	41	36	172	1	173	–	1	–	–	1	–	1	173	1	174
Texas Dental College	38	33	23	18	110	2	112	–	1	–	–	1	–	1	111	2	113
Virginia																	
Medical College of Virginia'	48	32	28	31	139	–	139	–	–	–	–	–	–	–	139	–	139
Wisconsin																	
Marquette University	76	52	63	57	245	3	248	34	–	–	–	–	34	34	245	37	282
TOTALS - 1941	2476	2072	1974	1833	8273	82	8355	327	22	90	186*	288	337	625	8561	419	8980

'Freshmen in Harvard School of Dental Medicine.

*Does not include post graduate students enrolled at other times in academic year.,

TABLE 2.—RECAPITULATION OF UNDERGRADUATE ENROLLMENT IN THE DENTAL SCHOOLS OF THE UNITED STATES, 1932-1941 INCLUSIVE

SCHOOL OR COLLEGE	1932-1933	1933-1934	1934-1935	1935-1936	1936-1937	1937-1938	1938-1939	1939-1940	1940-1941	1941-1942
California										
College of Physicians & Surgeons	137	136	142	136	141	135	151	147	151	163
University of California	138	128	140	142	159	152	179	163	168	181
University of Southern California	315	282	286	298	348	327	297	309	338	365
District of Columbia										
Georgetown University	258	208	193	165	124	155	166	165	183	201
Howard University	37	38	35	38	37	40	45	58	72	88
Georgia										
Atlanta-Southern Dental College	294	294	284	301	326	299	313	318	319	351
Illinois										
Loyola University, Chicago	382	321	293	272	305	269	264	259	269	274
Northwestern University	335	347	322	341	325	326	302	286	295	295
University of Illinois	91	97	125	146	162	196	220	222	224	227
Indiana										
Indiana University	156	152	166	163	188	152	137	118	113	130
Iowa										
State University of Iowa	143	141	145	167	186	145	118	117	112	135
Kentucky										
University of Louisville	120	121	111	122	107	104	139	163	177	186
Louisiana										
Loyola University, New Orleans	142	147	133	134	165	166	177	167	154	156
Maryland										
University of Maryland	354	324	352	294	219	222	216	255	310	322
Massachusetts										
*Harvard University	122	122	127	151	145	152	154	154	146	119
Tufts College	286	283	258	257	240	240	249	245	257	282
Michigan										
University of Detroit	46	86	127	101	95	100	114	112	106	91
University of Michigan	183	146	151	161	150	135	153	162	158	186
Minnesota										
University of Minnesota	220	214	275	293	302	283	242	208	197	264
Missouri										
University of Kansas City	229	222	231	238	241	203	207	204	240	259
St. Louis University	168	159	154	178	200	188	170	150	167	236
Washington University	181	161	139	131	122	116	120	123	90	107
Nebraska										
Creighton University	98	96	92	96	77	76	71	75	76	76
University of Nebraska	92	72	66	73	76	67	62	55	48	73
New York										
Columbia University	178	178	183	179	196	201	198	203	215	206
New York University	499	504	516	518	532	540	535	533	551	561
University of Buffalo	132	137	131	123	117	130	140	141	142	135
Ohio										
Ohio State University	191	198	198	207	202	193	202	209	222	235
Western Reserve University	120	107	116	121	124	132	140	162	161	172
Oregon										
North Pacific College of Oregon	198	178	153	157	191	158	167	182	171	220
Pennsylvania										
Temple University	507	500	510	507	457	430	437	405	439	460
University of Pennsylvania	337	326	324	341	382	401	417	414	425	413
University of Pittsburgh	235	186	184	187	163	127	159	220	297	334
Tennessee										
Meharry Medical College	27	20	22	25	21	33	34	33	41	51
University of Tennessee	121	113	93	87	113	108	111	109	105	110
Texas										
Baylor University	106	102	107	110	125	128	134	151	144	173
Texas Dental College	53	47	59	65	79	80	81	81	87	112
Virginia										
Medical College of Virginia	103	99	90	110	112	124	136	137	135	139
Wisconsin										
Marquette University	174	168	142	171	145	154	175	192	215	248
ANNUAL TOTALS	7508	7160	7175	7306	7397	7184	7331	7407	7720	8253
ANNUAL AVERAGE PER SCHOOL	193	184	184	187	189	184	188	190	198	214

*Includes 9 in Harvard School of Dental Medicine.

TABLE 3.—PRE-DENTAL COLLEGE TRAINING OF UNDERGRADUATES IN REGULAR COURSE IN THE DENTAL SCHOOLS OF THE UNITED STATES AS OF OCTOBER 15, 1941

SCHOOL OR COLLEGE	ALL UNDERGRADUATES							FRESHMEN					
	Less Than 2 Years	2 Years	3 Years	4 Years Without Degree	Bachelor's Degree	Beyond Bachelor's Degree	Total	2 Years	3 Years	4 Years Without Degree	Bachelor's Degree	Beyond Bachelor's Degree	Total
California													
College of Physicians & Surgeons	1	106	34	2	15	5	163	27	15	1	3	2	48
University of California	3	115	35	6	22	–	181	35	12	1	8	–	56
University of Southern California	3	288	29	5	55	5	385	114	10	–	17	4	145
District of Columbia													
Georgetown University	1	79	41	16	62	2	201	24	16	5	20	1	66
Howard University	–	17	13	4	54	1	89	3	5	2	19	–	29
Georgia													
Atlanta-Southern Dental College	–	228	42	9	71	1	351	67	14	–	20	–	101
Illinois													
Loyola University, Chicago	3	203	24	5	37	2	274	37	6	3	14	–	60
Northwestern University	–	152	56	13	70	4	295	43	17	11	19	3	93
University of Illinois	–	127	51	2	47	–	227	32	15	2	9	–	58
Indiana													
Indiana University	–	71	32	6	21	–	130	24	12	3	5	–	44
Iowa													
State University of Iowa	1	73	30	1	28	–	133	16	12	1	11	–	40
Kentucky													
University of Louisville	–	71	48	19	46	2	186	24	12	5	12	1	54
Louisiana													
Loyola University, New Orleans	–	104	20	5	26	1	156	27	6	1	8	–	42
Maryland													
University of Maryland	–	191	47	8	76	–	322	38	28	9	23	–	98
Massachusetts													
*Harvard University	–	44	19	–	52	4	119	–	–	–	9	–	9
Tufts College	–	134	45	8	89	6	282	44	17	3	19	–	83
Michigan													
University of Detroit	–	65	10	2	13	1	91	7	2	1	4	–	14
University of Michigan	–	80	51	2	43	10	186	26	24	2	16	1	69
Minnesota													
University of Minnesota	–	172	55	14	17	6	264	54	19	3	6	–	82
Missouri													
University of Kansas City	–	181	32	6	40	–	259	38	7	2	13	–	60
St. Louis University	–	143	31	3	49	10	236	48	11	1	21	–	81
Washington University	2	50	15	10	29	1	107	19	6	7	12	–	44
Nebraska													
Creighton University	–	56	9	2	9	–	76	15	4	–	2	–	21
University of Nebraska	2	48	12	3	8	–	73	22	7	2	1	–	32
New York													
Columbia University	–	–	45	3	148	10	206	–	7	–	41	3	51
New York University	–	35	154	16	349	7	561	13	48	7	79	2	149
University of Buffalo	–	64	29	1	41	–	135	21	14	1	14	–	50
Ohio													
Ohio State University	–	102	59	12	61	1	235	28	13	6	9	1	57
Western Reserve University	–	62	55	12	43	–	172	23	22	3	12	–	60
Oregon													
North Pacific College of Oregon	–	124	33	19	32	12	220	38	12	7	14	1	72
Pennsylvania													
Temple University	–	279	63	31	87	–	460	61	24	14	22	–	121
University of Pennsylvania	–	156	74	9	165	9	413	48	24	4	42	3	121
University of Pittsburgh	–	158	62	14	82	18	334	38	22	8	28	–	96
Tennessee													
Meharry Medical College	–	9	5	2	35	–	51	4	1	–	18	–	23
University of Tennessee	2	47	22	12	26	1	110	12	8	5	3	–	28
Texas													
Baylor University	–	92	40	16	25	–	173	27	17	6	7	–	57
Texas Dental College	–	66	14	3	28	1	112	17	5	3	13	–	38
Virginia													
Medical College of Virginia	–	55	34	11	39	–	139	14	14	6	14	–	48
Wisconsin													
Marquette University	–	136	40	8	63	1	248	34	18	5	19	–	76
TOTALS	18	4183	1510	320	2203	121	8355	1162	526	140	626	22	2476

*Includes 9 in Harvard School of Dental Medicine.

TABLE 4.—PRE-DENTAL COLLEGE TRAINING OF GRADUATES OF THE DENTAL SCHOOLS IN THE UNITED STATES FOR YEAR ENDING JUNE 30, 1941

SCHOOL OR COLLEGE	Less Than 2 Years	2 Years	3 Years	4 Years Without Degree	Bachelor's Degree	Beyond Bachelor's Degree	Total	Per Cent With Bachelor's Degree	No. Graduating in Combined Course 6 Yrs.	No. Graduating in Combined Course 7 Yrs. or More
California										
College of Physicians & Surgeons	2	16	3	2	3	1	27	15	5	1
University of California	3	11	2	–	11	–	27	41	10	10
University of Southern California	26	38	5	–	6	–	75	8	16	25
District of Columbia										
Georgetown University	–	11	10	–	19	1	41	49	–	–
Howard University	–	2	1	–	6	1	10	70	–	–
Georgia										
Atlanta-Southern Dental College	2	30	2	2	15	1	52	31	–	–
Illinois										
Loyola University, Chicago	14	20	5	–	4	–	43	9	–	–
Northwestern University	–	53	5	1	21	–	80	26	–	–
University of Illinois	–	32	7	–	7	2	48	18	31	–
Indiana										
Indiana University	1	10	3	1	3	–	18	16	–	–
Iowa										
State University of Iowa	4	7	2	–	2	1	16	19	2	–
Kentucky										
University of Louisville	–	13	9	3	14	2	41	39	–	–
Louisiana										
Loyola University, New Orleans	2	15	5	1	4	–	27	15	–	–
Maryland										
University of Maryland	–	41	12	1	20	–	74	27	–	–
Massachusetts										
Harvard University	–	12	4	1	13	3	33	48	–	–
Tufts College	–	28	12	–	22	1	63	36	–	–
Michigan										
University of Detroit	–	18	3	1	7	–	29	24	1	–
University of Michigan	–	15	9	–	6	4	34	29	–	5
Minnesota										
University of Minnesota	–	5	4	–	2	2	13	30	1	–
Missouri										
University of Kansas City	4	14	–	–	7	–	25	28	–	–
St. Louis University	1	8	5	3	7	1	25	32	–	–
Washington University	2	12	6	1	2	2	25	16	2	–
Nebraska										
Creighton University	4	6	5	–	3	–	18	17	4	–
University of Nebraska	5	3	–	–	2	–	10	20	3	2
New York										
Columbia University	–	–	19	4	23	7	53	57	–	15
New York University	–	9	19	3	85	3	119	74	–	–
University of Buffalo	–	24	3	1	14	1	43	35	–	–
Ohio										
Ohio State University	–	24	7	1	9	–	41	22	–	–
Western Reserve University	–	18	10	2	14	–	44	32	6	–
Oregon										
North Pacific College of Oregon	–	15	–	–	10	–	25	40	6	–
Pennsylvania										
Temple University	–	72	4	3	16	–	95	17	–	–
University of Pennsylvania	–	42	25	2	43	3	115	40	–	–
University of Pittsburgh	–	25	1	–	6	14	46	43	12	–
Tennessee										
Meharry Medical College	–	2	–	–	7	–	9	77	–	–
University of Tennessee	1	9	1	3	1	–	15	6	–	–
Texas										
Baylor University	3	10	7	2	3	–	25	12	1	–
Texas Dental College	–	7	1	–	2	1	11	27	–	–
Virginia										
Medical College of Virginia	–	15	7	3	9	–	34	26	–	–
Wisconsin										
Marquette University	–	21	10	–	8	–	39	21	2	1
TOTALS	74	713	233	41	456	51	1568	32	102	62

TABLE 5.—GRADUATES WITH PRE-DENTAL COLLEGE TRAINING OF BACHELOR'S DEGREE OR BEYOND IN THE DENTAL SCHOOLS OF THE UNITED STATES, 1935 TO 1941 INCLUSIVE

SCHOOL OR COLLEGE	1935		1936		1937		1938		1939		1940		1941		
	Total No.	No. With Degree	Total No.	No. With Degree	Total No.	No. With Degree	Total No.	No. With Degree	Total No.	No. With Degree	Total No.	No. With Degree	Total No.	No. With Degree	Per Cent with Degree
California															
College of Physicians & Surgeons	35	3	22	8	33	18	36	10	18	3	36	9	27	4	15
University of California	36	10	32	11	32	12	30	21	37	17	38	4	27	11	41
University of Southern California	67	31	59	12	54	10	72	20	65	16	71	10	75	6	8
District of Columbia															
Georgetown University	65	3	73	7	18	2	29	9	45	12	25	9	41	20	49
Howard University	3	3	6	2	11	1	7	1	7	4	7	4	10	7	70
Georgia															
Atlanta-Southern Dental College	70	3	75	5	64	5	64	3	69	11	110	14	52	16	31
Illinois															
Loyola University, Chicago	87	–	71	4	60	–	64	–	75	7	80	5	43	4	9
Northwestern University	91	27	91	23	85	20	99	30	108	13	75	27	80	21	26
University of Illinois	23	12	22	18	21	19	29	25	37	31	58	12	48	9	18
Indiana															
Indiana University	44	2	28	3	45	4	43	5	46	2	44	1	18	3	16
Iowa															
State University of Iowa	29	2	22	3	44	1	46	2	45	1	38	–	16	3	19
Kentucky															
University of Louisville	33	9	35	5	40	8	8	1	27	8	28	10	41	16	39
Louisiana															
Loyola University, New Orleans	29	–	29	2	36	1	38	2	35	6	46	3	27	4	15
Maryland															
University of Maryland	86	2	79	1	73	3	66	4	63	4	15	5	74	20	27
Massachusetts															
Harvard University	23	6	39	17	24	11	33	13	29	10	39	21	33	16	48
Tufts College	59	11	66	8	64	13	51	17	64	24	57	28	63	23	36
Michigan															
University of Detroit	33	12	35	8	37	11	14	3	16	–	23	2	29	7	24
University of Michigan	30	8	46	12	49	8	24	5	33	7	35	9	34	10	29
Minnesota															
University of Minnesota	74	2	75	14	87	–	92	9	100	13	75	7	13	4	30
Missouri															
University of Kansas City	63	5	50	3	44	10	60	9	67	8	44	2	25	7	28
St. Louis University	31	–	38	1	38	5	63	12	53	6	32	1	25	8	32
Washington University	41	2	45	3	25	1	31	3	20	1	37	6	25	4	16
Nebraska															
Creighton University	26	2	20	1	28	–	18	–	24	4	13	2	18	3	17
University of Nebraska	18	1	17	3	11	–	19	2	18	4	18	5	10	2	20
New York															
Columbia University	53	34	34	28	45	35	46	44	51	47	44	29	53	30	57
New York University	119	32	128	25	117	37	121	34	128	57	121	64	119	88	74
University of Buffalo	36	5	39	7	35	13	29	9	34	17	50	28	43	15	35
Ohio															
Ohio State University	54	10	45	3	58	6	40	3	55	–	42	7	41	9	22
Western Reserve University	27	12	25	10	23	13	28	13	28	17	35	17	44	14	32
Oregon															
North Pacific College of Oregon	45	3	35	4	36	5	35	4	39	–	62	7	25	10	40
Pennsylvania															
Temple University	120	8	110	6	127	–	120	3	114	3	84	8	95	16	17
University of Pennsylvania	93	17	75	9	79	19	72	19	98	27	90	40	115	46	40
University of Pittsburgh	60	21	48	18	70	34	40	21	20	6	33	10	46	20	43
Tennessee															
Meharry Medical College	4	2	6	5	4	3	5	1	5	1	5	3	9	7	77
University of Tennessee	32	2	21	1	20	2	21	3	20	–	35	11	15	1	6
Texas															
Baylor University	25	2	23	2	26	4	32	1	27	3	35	5	25	3	12
Texas Dental College	12	1	10	–	11	1	19	1	17	–	31	3	11	3	27
Virginia															
Medical College of Virginia	15	1	23	3	22	1	16	2	31	6	23	5	34	9	26
Wisconsin															
Marquette University	49	14	39	14	43	16	44	19	25	6	23	12	39	8	21
TOTALS	1840	320	1736	309	1739	352	1704	383	1794	402	1757	445	1568	507	32

TABLE 6.—DISTRIBUTION OF UNDERGRADUATE STUDENTS BY STATES, TERRITORIES AND FOREIGN COUNTRIES IN THE DENTAL SCHOOLS OF THE UNITED STATES AS OF OCTOBER 15, 1941

	Alabama	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	Dist. of Col.	Florida	Georgia	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts	Michigan	Minnesota	Mississippi
California																							
College of Physicians & Surgeons	-	1	-	126	1	-	-	-	-	-	1	1	-	-	-	-	-	-	1	-	-	-	-
University of California	-	-	-	169	1	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	2	-	-
University of Southern California	-	17	-	205	11	2	-	-	1	-	14	6	1	4	1	1	-	-	-	1	6	1	1
District of Columbia																							3
Georgetown University	-	-	-	-	-	17	-	45	3	-	-	-	-	-	-	-	-	5	3	11	-	-	-
Howard University	7	-	-	-	-	-	-	3	6	1	-	1	1	-	-	-	-	-	5	1	-	-	-
Georgia																							
Atlanta-Southern Dental College	46	-	-	4	-	4	1	5	49	97	-	-	2	-	1	1	4	-	4	4	2	-	12
Illinois																							
Loyola University, Chicago	-	-	-	-	-	2	-	-	1	-	-	197	7	-	-	2	-	-	1	4	18	2	-
Northwestern University	4	1	1	2	2	4	-	1	7	2	1	115	7	1	2	1	2	-	-	9	16	2	2
University of Illinois	-	-	-	-	-	1	-	-	-	-	-	146	-	1	2	-	-	-	1	-	1	-	-
Indiana																							
Indiana University	1	-	-	-	-	12	-	-	-	-	-	1	94	-	-	2	-	-	-	2	2	-	-
Iowa																							
State University of Iowa	-	-	-	-	1	-	-	-	-	-	-	2	-	106	-	-	-	1	-	1	-	-	-
Kentucky																							
University of Louisville	6	-	2	-	-	-	-	-	8	-	-	-	5	-	-	82	-	2	-	2	-	-	1
Louisiana																							
Loyola University, New Orleans	10	-	2	-	-	2	-	-	9	-	-	-	-	-	-	2	102	-	-	-	1	-	7
Maryland																							
University of Maryland	1	-	-	-	-	34	2	4	2	-	-	-	-	-	-	-	-	2	50	17	-	-	-
Massachusetts																							
*Harvard University	-	-	-	-	-	8	-	-	-	-	-	1	-	-	-	-	-	10	-	59	-	1	-
Tufts College	-	-	-	-	-	34	-	-	-	-	1	-	-	-	-	-	-	7	-	158	-	-	-
Michigan																							
University of Detroit	-	-	-	-	*	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	85	-	-
University of Michigan	-	-	-	-	2	1	-	-	-	1	-	3	-	-	-	-	-	1	-	2	142	-	-
Minnesota																							
University of Minnesota	-	-	-	1	-	-	-	-	1	-	1	1	-	3	-	-	-	-	-	2	1	186	-
Missouri																							1
University of Kansas City	1	7	6	3	10	1	-	1	1	-	3	1	1	5	53	-	1	2	-	2	1	-	1
St. Louis University	-	1	3	-	1	9	-	-	2	1	-	32	1	3	-	2	-	1	-	6	1	2	1
Washington University	1	-	8	1	2	2	-	-	-	-	2	17	1	-	2	2	-	-	-	1	-	1	1
Nebraska																							
Creighton University	-	-	-	-	1	-	-	-	-	-	1	2	-	8	1	-	-	-	-	1	-	8	-
University of Nebraska	-	-	-	1	8	-	-	-	-	-	-	1	1	3	1	-	-	-	-	-	-	1	-
New York																							
Columbia University	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	2	-	2	-	-	-
New York University	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
University of Buffalo	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	2	-	-	-
Ohio																							
Ohio State University	-	-	-	-	-	2	-	-	-	-	-	-	1	-	-	1	-	-	-	-	1	-	-
Western Reserve University	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-
Oregon																							
North Pacific College of Oregon	-	1	-	2	1	-	-	-	-	-	11	-	-	1	-	-	-	-	-	-	-	-	-
Pennsylvania																							
Temple University	-	-	-	-	-	18	12	-	3	-	-	-	-	-	-	-	-	1	1	7	-	-	-
University of Pennsylvania	-	-	-	-	-	18	3	-	-	-	-	-	-	-	-	-	-	3	1	7	-	-	1
University of Pittsburgh	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-
Tennessee																							
Meharry Medical College	2	-	2	-	-	2	1	-	1	-	-	4	-	-	-	-	2	-	2	-	5	-	2
University of Tennessee	9	-	9	-	-	-	-	-	1	-	1	-	-	-	-	2	2	-	-	2	-	-	19
Texas																							
Baylor University	1	2	8	-	-	-	-	-	1	-	1	-	-	-	-	-	2	-	-	1	1	-	-
Texas Dental College	-	-	2	1	-	-	-	-	1	1	-	-	-	-	-	2	6	-	-	-	-	-	1
Virginia																							
Medical College of Virginia	-	1	-	-	-	1	1	2	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Wisconsin																							
Marquette University	-	-	-	-	-	2	-	-	-	-	-	4	-	1	-	-	-	-	-	-	10	5	-
TOTAL	89	32	43	518	50	183	20	64	90	74	36	537	123	136	63	102	122	35	79	310	289	208	80

*Includes 9 in Harvard School of Dental Medicine.

TABLE 6.—DISTRIBUTION OF UNDERGRADUATE STUDENTS BY STATES, TERRITORIES AND FOREIGN COUNTRIES IN THE DENTAL SCHOOLS OF THE UNITED STATES AS OF OCTOBER 15, 1941 (Continued)

	Missouri	Montana	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	No. Carolina	No. Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	So. Carolina	So. Dakota	Tennessee	Texas	Utah	Vermont	Virginia	Washington	W. Virginia	Wisconsin	Wyoming	U.S.Possessions	Canada	Other Foreign Countries	Total
	-	-	-	2	-	-	-	1	-	-	1	-	2	-	-	-	-	-	-	4	-	-	4	-	-	6	-	4	163
	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	1	4	-	-	4	-	-	-	2	-	181
	2	2	-	-	-	2	4	9	-	1	5	-	1	1	-	-	1	-	-	40	2	-	4	1	2	2	21	1	11	385
	-	-	-	-	3	23	-	94	-	-	1	-	-	5	7	-	-	-	-	1	-	6	-	1	-	-	3	-	1	201
	-	-	-	-	-	5	-	8	7	-	1	-	-	4	-	3	-	2	7	-	-	8	-	2	-	-	3	1	12	99
	-	-	1	-	-	4	-	2	75	-	5	-	-	1	-	33	-	6	3	-	-	3	-	8	2	-	3	-	-	351
	1	-	-	-	1	2	-	10	-	1	9	-	-	3	-	-	-	-	-	1	-	-	1	-	14	-	1	2	1	274
	1	1	-	-	1	1	-	2	2	7	8	4	2	6	1	3	4	1	2	8	-	2	8	12	10	1	8	1	11	295
	-	-	-	-	-	12	-	55	-	-	-	-	-	8	-	-	-	1	-	-	46	-	-	-	-	-	1	-	8	227
	-	-	-	-	-	2	-	2	-	-	6	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	4	-	-	120
	1	2	1	-	-	3	-	4	-	2	-	1	-	2	-	-	2	-	-	-	-	-	-	-	1	1	-	-	-	133
	1	-	-	-	-	1	-	21	4	1	8	-	-	-	1	4	-	17	1	-	-	2	-	13	-	-	1	-	-	186
	1	-	-	-	-	-	-	1	1	-	1	2	-	-	-	-	-	1	4	-	-	-	-	-	-	-	5	-	5	156
	-	-	-	-	1	52	-	91	7	-	1	-	-	4	7	4	-	-	-	-	3	4	-	15	-	-	11	-	1	322
	-	-	-	-	8	5	-	13	-	1	-	-	-	2	8	-	-	-	1	-	1	-	-	-	-	-	-	-	1	119
	-	-	-	-	16	4	-	36	-	-	-	-	-	-	20	-	-	-	-	-	2	-	-	1	-	-	1	-	2	283
	-	-	-	-	-	-	-	1	-	-	1	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	91
	-	-	-	-	-	3	-	10	-	-	7	1	-	1	-	-	-	-	-	-	-	-	-	2	-	-	1	-	9	186
	1	4	-	-	-	2	-	7	-	16	-	-	1	-	-	-	5	-	-	-	-	-	1	1	22	2	1	2	2	264
	61	1	2	-	-	2	9	6	-	6	-	42	-	2	-	-	2	-	2	1	1	-	1	-	1	-	8	1	-	358
	31	2	1	-	-	14	-	61	-	-	4	1	1	4	10	-	-	1	2	-	2	-	-	-	2	-	5	-	6	336
	22	2	-	-	-	1	-	11	-	-	-	9	-	1	2	-	1	1	6	1	1	-	1	1	2	-	1	-	2	107
	-	6	25	-	1	-	-	4	-	1	-	1	1	-	-	-	2	-	-	-	-	-	-	-	2	4	2	-	-	78
	-	-	45	-	-	2	-	1	-	2	-	1	-	1	-	-	2	-	-	-	-	-	1	-	-	1	-	-	-	73
	-	-	-	-	-	14	-	178	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	306
	-	-	-	-	-	39	-	529	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	561
	-	-	-	-	-	3	-	126	-	-	1	-	-	1	1	-	-	-	-	-	-	-	-	1	-	-	-	1	-	135
	-	-	-	-	-	3	-	26	-	-	197	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	235
	-	-	-	-	-	11	-	54	-	-	95	-	-	4	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	173
	-	10	-	-	-	1	-	-	-	-	-	-	94	-	-	-	-	-	-	11	-	-	71	-	-	1	4	21	-	320
	-	-	-	-	1	99	-	74	-	-	-	-	-	330	10	-	-	-	-	-	-	1	-	-	-	-	3	-	-	460
	-	-	-	-	-	87	-	305	1	-	1	-	-	75	5	-	-	-	-	-	1	-	-	-	-	-	2	-	6	413
	-	-	-	-	-	26	-	136	-	-	7	-	-	151	-	-	-	-	-	-	-	-	-	8	1	-	-	-	-	334
	1	-	-	-	-	2	3	3	-	2	-	-	-	2	1	1	-	4	4	-	-	2	-	-	-	-	-	-	4	51
	1	-	-	-	-	-	-	-	2	-	-	1	-	-	-	-	-	60	-	-	-	-	-	-	-	-	-	-	-	110
	-	-	1	-	-	-	4	1	1	-	-	10	-	1	-	-	-	-	129	-	-	-	-	-	-	-	1	-	-	173
	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	1	96	-	-	-	-	1	-	-	-	-	-	112
	-	-	-	-	-	5	-	14	27	-	1	-	-	2	-	10	-	-	-	-	-	67	-	5	-	-	-	-	-	130
	-	4	-	-	-	7	-	51	-	2	2	-	-	2	-	-	-	-	-	-	-	-	-	-	156	-	2	-	-	348
148	35	77	4	32	426	17	1819	121	42	334	82	90	514	74	57	25	95	260	74	12	96	90	78	218	12	97	32	82	6355

TABLE 7.—SCHOOLS OF DENTAL HYGIENE

Title of School or Course	Institution With Which Connected	Admission Requirement	Length of Course	Enrollment	Degree or Certificate
Curriculum for the Training of Dental Hygienists	College of Dentistry University of California San Francisco	2 Years in Liberal Arts	2 Years	10	B.S. in Dental Hygiene
Division of Dental Hygiene	College of Dentistry University of Southern California, Los Angeles	2 Years in Liberal Arts	2 Years	6	B.S. in Dental Hygiene
Course for Dental Hygienists	College of Dentistry Howard University Washington, D.C.	High School Course	1 Year	3	Certificate
Course for Dental Hygienists and Dental Assistants	Dental School Northwestern University Chicago, Illinois	High School Course	2 Years	23	Certificate
Curriculum in Dental Hygiene	School of Dentistry University of Michigan Ann Arbor	High School Course	2 Years	35	Certificate
Course for Dental Hygienists	School of Dentistry University of Minnesota Minneapolis	High School Course	2 Years	90	Graduate Dental Hygienist (GDH)
Courses for Dental Hygienists	School of Dental and Oral Surgery, Columbia University New York City	High School Course	1 Year	41	Certificate
Courses for Dental Assistants and Dental Hygienists	School of Dentistry North Pacific College of Oregon, Portland	High School Course	1 Year 2 Years	16	Certificate
School of Oral Hygiene	School of Dentistry Temple University Philadelphia	High School Course or 3 Years in Teachers' College	1 Year 1 Year	22	Certificate B.S. in Education with Certificate in Oral Hygiene
Courses in Oral Hygiene	School of Dentistry University of Pennsylvania Philadelphia	High School Course	1 Year	37	Certificate
School for Dental Hygienists	School of Dentistry Meharry Medical College Nashville, Tennessee	High School Course	2 Years	0	Certificate
School of Dental Hygiene	College of Dentistry University of Tennessee Memphis	High School Course	2 Years	10	Certificate
Curriculum for Dental Hygienists	Dental School Marquette University Milwaukee, Wisconsin	High School Course	2 Years	34	Certificate
Forsyth Training School for Dental Hygienists	Forsyth Dental Infirmary Boston, Massachusetts	High School Course	Eleven Months	54	Certificate
School for Dental Hygienists	Rochester Dental Dispensary Rochester, New York	High School Course	1 Year	65	Certificate
Department of Oral Hygiene	West Liberty State Teachers' College West Liberty, W. Va.	High School Course	2 Years 2 Additional Years	15	Certificate B.S. in Oral Hygiene
School for Dental Hygienists	The Murry and Leonie Guggenheim Dental Clinic New York City	High School Course	1 Year	43	Certificate
TOTAL				504	

TABLE 8.—ADMINISTRATIVE OFFICERS AND SESSIONS IN THE DENTAL SCHOOLS OF THE UNITED STATES

SCHOOL OR COLLEGE	LOCATION	DEAN	SESSION 1941-1942
California			
College of Physicians & Surgeons	San Francisco, California	Ernest G. Sloman	Sept. 2 Apr. 28
University of California	San Francisco, California	Willard C. Fleming	Aug. 22 May 17
University of Southern California	Los Angeles, California	Lewis E. Ford	Sept. 15 June 4
District of Columbia			
Georgetown University	Washington, D. C.	Joseph L. B. Murray	Sept. 22 May 30
Howard University	Washington, D. C.	Russell A. Dixon	Sept. 22 June 5
Georgia			
Atlanta-Southern Dental College	Atlanta, Georgia	Ralph R. Byrnes	Sept. 22 June 3
Illinois			
Loyola University, Chicago	Chicago, Illinois	William H. G. Logan	Sept. 30 May 29
Northwestern University	Chicago, Illinois	Charles W. Freeman	Sept. 29 June 13
University of Illinois	Chicago, Illinois	Howard M. Marjerison	Sept. 30 June 12
Indiana			
Indiana University	Indianapolis, Indiana	William H. Crawford	Sept. 10 June 1
Iowa			
State University of Iowa	Iowa City, Iowa	Alvin W. Bryan	Sept. 25 June 1
Kentucky			
University of Louisville	Louisville, Kentucky	John T. O'Rourke	Sept. 15 June 2
Louisiana			
Loyola University, New Orleans	New Orleans, Louisiana	Sydney L. Tiblier	Sept. 15 June 1
Maryland			
University of Maryland	Baltimore, Maryland	J. Ben Robinson	Sept. 16 June 6
Massachusetts			
Harvard University	Boston, Massachusetts	Leroy M. S. Miner	Sept. 22 June 19
Tufts College	Boston, Massachusetts	Basil G. Bibby	Sept. 25 June 15
Michigan			
University of Detroit	Detroit, Michigan	Leo A. Cadarette	Sept. 15 June 3
University of Michigan	Ann Arbor, Michigan	Russell W. Bunting	Sept. 29 June 20
Minnesota			
University of Minnesota	Minneapolis, Minnesota	William F. Lasby	Sept. 29 June 12
Missouri			
University of Kansas City	Kansas City, Missouri	Roy J. Rinehart	Sept. 15 June 7
St. Louis University	St. Louis, Missouri	Thomas E. Purcell	Sept. 23 June 2
Washington University	St. Louis, Missouri	Benno E. Lischer	Sept. 25 June 9
Nebraska			
Creighton University	Omaha, Nebraska	Frank J. Viner	Sept. 22 June 4
University of Nebraska	Lincoln, Nebraska	Bert L. Hooper	Sept. 18 June 8
New York			
Columbia University	New York City	Willard Cole Rappleye H. Holliday, Associate	Sept. 19 June 2
New York University	New York City	Allen T. Newman	Sept. 10 June 7
University of Buffalo	Buffalo, New York	Edward W. Koch R. W. Groh, Associate	July 7 June 13
Ohio			
Ohio State University	Columbus, Ohio	Wendell D. Postle	Sept. 30 June 15
Western Reserve University	Cleveland, Ohio	William L. Wylie	Sept. 25 June 17
Oregon			
North Pacific College of Oregon	Portland, Oregon	Louis J. FitzPatrick	Oct. 1 June 15
Pennsylvania			
Temple University	Philadelphia, Pennsylvania	C. Barton Addie, Acting	Sept. 24 May 20
University of Pennsylvania	Philadelphia, Pennsylvania	J. L. T. Appleton	Sept. 22 June 10
University of Pittsburgh	Pittsburgh, Pennsylvania	H. Edmund Friesell	Sept. 23 May 31
Tennessee			
Meharry Medical College	Nashville, Tennessee	Donley H. Turpin	Oct. 1 May 26
University of Tennessee	Memphis, Tennessee	H. D. Dean	Sept. 29 June 10
Texas			
Baylor University	Dallas, Texas	Frederick W. Hinds	Sept. 29 June 1
Texas Dental College	Houston, Texas	Frederick C. Elliott	Sept. 29 June 8
Virginia			
Medical College of Virginia	Richmond, Virginia	Harry Bear	Sept. 2 June 2
Wisconsin			
Marquette University	Milwaukee, Wisconsin	Henry L. Banzhaf	Sept. 26 June 10

TABLE 9.—NUMBER OF STUDENTS ENROLLED IN THE FRESHMAN CLASSES IN THE DENTAL SCHOOLS OF THE UNITED STATES, AS OF OCTOBER 15, 1941, NUMBER ACCEPTED WHO DID NOT MATRICULATE OR CONTINUE AND NUMBER REJECTED

SCHOOL OR COLLEGE	No. Enrolled	No. Accepted Who Did Not Matriculate or Continue	No. Rejected
California			
College of Physicians & Surgeons	48	4	5
University of California	56	20	11
University of Southern California	145	24	21
District of Columbia			
Georgetown University	66	21	254
Howard University	29	10	25
Georgia			
Atlanta-Southern Dental College	101	31	51
Illinois			
Loyola University, Chicago	60	15	42
Northwestern University	93	15	56
University of Illinois	58	5	48
Indiana			
Indiana University	44	19	58
Iowa			
State University of Iowa	40	13	16
Kentucky			
University of Louisville	54	14	100
Louisiana			
Loyola University, New Orleans	42	22	10
Maryland			
University of Maryland	98	43	113
Massachusetts			
Harvard University	9*	–	–
Tufts College	83	20	236
Michigan			
University of Detroit	14	13	18
University of Michigan	69	13	84
Minnesota			
University of Minnesota	82	7	13
Missouri			
University of Kansas City	60	11	38
St. Louis University	81	17	11
Washington University	44	20	35
Nebraska			
Creighton University	21	9	9
University of Nebraska	32	7	3
New York			
Columbia University	51	16	188
New York University	149	33	163
University of Buffalo	50	18	149
Ohio			
Ohio State University	57	14	15
Western Reserve University	60	68	82
Oregon			
North Pacific College of Oregon	72	14	–
Pennsylvania			
Temple University	121	44	98
University of Pennsylvania	121	34	84
University of Pittsburgh	96	41	13
Tennessee			
Meharry Medical College	23	7	7
University of Tennessee	28	14	17
Texas			
Baylor University	57	13	37
Texas Dental College	38	13	6
Virginia			
Medical College of Virginia	48	37	68
Wisconsin			
Marquette University	76	18	62

TABLE 10.—DENTAL LICENSING EXAMINATIONS IN 1940

Board	No. Examined	No. Passed	% Passed	No. Failed	% Failed	No. Schools Represented	No. Licensed
Alabama	32	29	90	3	10	6	29
Arizona	17	7	40	10	60	8	7
Arkansas	17	15	88	2	12	8	15
California	202	166	72	36	18	21	166
Colorado	10	9	90	1	10	3	9
Connecticut	68	57	84	11	16	24	57
Delaware	9	4	45	5	55	4	4
District of Columbia	29	13	45	16	55	11	13
Florida	67	34	51	33	49	21	34
Georgia	61	50	82	11	18	6	50
Idaho	14	10	71	4	29	7	10
Illinois	187	178	95	9	5	12	178
Indiana	57	53	93	4	7	7	53
Iowa	42	40	95	2	5	6	40
Kansas	16	16	100	–	–	2	16
Kentucky	27	24	89	3	11	6	24
Louisiana	39	39	100	–	–	3	39
Maine	12	11	92	1	8	6	11
Maryland	15	13	87	2	13	6	12
Massachusetts	91	88	97	3	3	13	88
Michigan	71	64	90	7	10	9	64
Minnesota	71	69	97	3	3	7	68
Mississippi	16	14	87	2	13	7	14
Missouri	69	64	93	5	7	4	64
Montana	18	13	72	5	28	7	13
Nebraska	28	23	82	5	18	4	23
Nevada	4	–	–	4	100	4	–
New Hampshire	14	13	93	1	7	5	13
New Jersey	153	90	59	63	41	24	90
New Mexico	12	7	58	5	42	9	7
New York	467	396	85	71	15	25	390
North Carolina	49	32	65	17	35	9	32
North Dakota	4	4	100	–	–	1	4
Ohio	84	78	93	6	7	13	78
Oklahoma	26	21	81	5	19	6	21
Oregon	59	45	76	14	24	8	45
Pennsylvania	112	111	99	1	1	11	111
Rhode Island	11	11	100	–	–	5	11
South Carolina	17	13	76	4	24	3	13
South Dakota	5	5	100	–	–	3	5
Tennessee	37	31	84	6	16	5	31
Texas	121	83	69	38	31	24	82
Utah	6	6	100	–	–	3	6
Vermont	4	3	75	1	25	3	3
Virginia	46	39	85	7	15	13	38
Washington	66	40	61	26	39	12	40
West Virginia	22	18	86	4	14	13	14
Wisconsin	31	31	100	–	–	8	31
Wyoming	5	5	100	–	–	4	5
TOTALS	2640	2185	83	455	17	47	2171

COMMITTEE ON LEGISLATION

PROTECTION OF CIVILIAN INTERESTS OF PERSONS IN MILITARY SERVICE

By SAMUEL R. LEWIS,* J.D., Chicago, Ill.

THE dentist who has been detailed by proper authority to duty with the Army, Navy, Marine Corps, Coast Guard or United States Public Health Service, or the dentist who is apt to be detailed in the near future, is frequently troubled by fears of what will happen to him in connection with numerous financial commitments that he may have made during his civilian life. This is a difficulty common to many classes of men who are called into governmental service and it has been recognized as such by Congress. October 17, 1940, the President approved a law which was prepared for the purpose of protecting, as far as possible, the civil rights of these men while they are in military service. This law, known as the Soldiers' and Sailors' Civil Relief Act of 1940, is similar to an act passed for the same purpose during the last war.

The provisions of the act extend to all of the persons in the above-mentioned services who are detailed for active duty and also to those persons who are being trained or educated under the supervision of the United States preliminary to induction into military service. The law is effective until May 15, 1945, or, if the United States is then at war, until six months after the treaty of peace.

Generally speaking, the law is designed to protect persons in these categories from proceedings and transactions resulting from the inability of the person who is in the service to perform his civil obligations. This protection does not result in complete suspension of all actions taken against persons in military service, but, in most cases, the court is given the right to determine whether military service interferes with the ability to perform the obligation.

The major features of the law apply to those persons who (1) may become defendants in a court action, (2) may have dependents occupying a dwelling for which the rent does not exceed $80 a month and who may become subject to an eviction or distress action, (3) may have contracted for the purchase of real or personal property on the instalment plan, (4) may have obligations relative to mortgages on real or personal property, (5) may have life insurance policies with a face value not exceeding $5,000, (6) may become liable for taxes or assessments on real property, (7) may become liable for income taxes or (8) may have initiated or acquired a right in lands controlled by the United States.

The provisions of the law vary for the treatment of the eight general situations which it covers, and in order to cover them in further detail, they will be considered separately.

WHEN PERSONS IN MILITARY SERVICE MAY BECOME DEFENDANTS IN A COURT ACTION

A judgment by default for failure to appear in an action shall not be entered in any case in any court until the plaintiff files "an affidavit showing the defendant is not in military service . . . or that plaintiff is not able to determine whether or not defendant is in such

*Secretary, Committee on Dental Legislation.

service." If the defendant is in military service, the court must appoint an attorney to represent him and protect his interest. The attorney has no power to waive any right of the absent defendant or bind him by his acts. The court may also require the plaintiff to file a bond to protect the party in military service from loss or damage caused by a judgment should the judgment be thereafter set aside in whole or in part. The court may also make any other protective order that it deems necessary to protect the defendant.

Any judgment entered against a person while he is in service or within thirty days thereafter may be opened by the court which rendered the judgment upon application by the person in service or his legal representative within ninety days after termination of such service, if the application makes it clear that some meritorious or legal defense to the action or some part thereof can be made.

At any stage thereof, any action or proceeding in any court in which a person in military service is involved, either as plaintiff or defendant, may be stayed by the court during the period of such service or within sixty days thereafter. Similarly, enforcements of judgments or orders may be stayed and any attachment or garnishment may be vacated or stayed when a defendant's ability to comply with the judgment or order is materially affected by reason of his military service, and the sureties, guarantors, endorsers, etc., may have the same protection.

Any stay of any action as provided above may be ordered by the court for the period of military service and three months thereafter and subject to such terms as may be just, whether as to payment in instalments of such amounts and at such times as the court may fix or otherwise. If the person in military service is a codefendant with others not in service, the plaintiffs may, by leave of the court, proceed against the others.

The period of military service, the law provides, shall not be included in the running of any statute of limitations.

WHEN PERSONS IN MILITARY SERVICE HAVE DEPENDENTS OCCUPYING A DWELLING

If the dependents of a person in military service are occupying a dwelling the rent for which does not exceed $80 a month, it is a misdemeanor to knowingly take part in an eviction or distress proceeding against such dependents except upon leave of the court. The Secretary of War or of the Navy has authority to order an allotment of the pay of a person in military service to discharge the rent of premises occupied for dwelling purposes by the wife, children or other dependents of such person.

It should be noted here that this law apparently only applies to rental of dwelling places and not to property occupied for office purposes. Legislation has been introduced in Congress for the purpose of extending relief to persons in connection with leases executed for offices, but this legislation has not been passed by Congress at this time.

WHEN PERSON IN MILITARY SERVICE MAY BE OBLIGATED ON INSTALMENT CONTRACTS OR MORTGAGES

The law provides that instalments, deposits, mortgages and the like, on either real or personal property, shall not be forfeited or foreclosed without court proceedings and the court may stay the case or conserve the interests of all parties in some equitable way, or may require a refund of any instalments which have been made as a condition to repossession by the seller, unless the defendant's ability to perform the contract is not materially affected by his military services.

The law specifically provides that no court may stay a proceeding to resume possession of a motor vehicle, tractor or the accessories of either, or for an order of sale thereof, if the property is en-

cumbered by a purchase money mortgage, conditional sales contract or a lease or bailment with a view to purchase, unless the court finds that 50 per cent or more of the purchase price has been paid. Thus, if a person going into service is purchasing an auto on the instalment plan and has not completed payment of 50 per cent of the purchase price, the seller may begin action to recover the automobile and the buyer cannot have the action stayed because of his military service. The court may order the seller to file a bond in order to protect the buyer against loss by reason of the judgment should it subsequently be set aside.

WHEN THE PERSON IN MILITARY SERVICE IS OBLIGATED FOR INSURANCE PREMIUMS

The law provides that, on application by a person in military service, the Administrator of Veterans' Affairs may guarantee payment of premiums on life insurance up to a face value of $5,000. The person in military service is given one year after leaving service to pay back these premiums and resume regular payments. If he fails to do so, the policy lapses and the cash surrender value accrues to the government to the extent necessary to meet the cost of the premiums that it has guaranteed. Any surplus accrues to the policy holder.

Insurance qualifies for protection (1) if obtained at least thirty days before the person enters military service; (2) if premiums are not more than one year overdue; (3) if loans on the policy do not exceed one-half of its cash value, or (4) if military service will not reduce the benefits or increase the premiums.

Policy holders who do not want government protection may pay their premiums as usual, or they may be able to arrange for automatic premium loans, or to have the government deduct premiums from military pay and remit directly to the insurance companies each month. In the latter case, the policy holder should arrange with the insurance company to accept payment in monthly instalments.

WHEN PERSONS IN MILITARY SERVICE MAY BECOME LIABLE FOR TAXES

When any person in military service, or a person in his behalf, shall file with the collector of taxes, or other officers whose duty it is to enforce the collection of taxes or assessments, an affidavit showing (a) that a tax or assessment has been assessed on real property owned and occupied for dwelling, agricultural or business purposes by a person in military service or his dependents prior to his service and still so occupied by his dependents or employes; (b) that such tax or assessment is unpaid, and (c) that, by reason of military service, the ability of such person to pay such tax or assessment is materially affected, no sale of the property may be made to enforce the collection of the tax or assessment, or any proceeding or action for such purpose commenced, except on leave of the court granted on application made by the collector or other officer. The court is authorized to stay such proceeding or sale for a period extending not more than six months after the termination of the period of military service by such person.

When by law such property may be sold or forfeited to enforce the collection of the tax or assessment, the person in military service has the right to redeem the property at any time not later than six months after the termination of service, but in no case later than six months after the date when the Soldiers' and Sailors' Civil Relief Act ceases to be in force.

If any tax or assessment shall not be paid when due, such tax or assessment due and unpaid will bear interest until paid at the rate of 6 per cent per annum.

With respect to the payment of past or future income taxes by any person in

military service, the act provides that such taxes shall be deferred for a period extending not more than six months after the termination of the period of service, if the person's ability to pay the tax is materially impaired by reason of service. No interest or any amount of tax collection of which is deferred, and no penalty for non-payment of such amount during such period, will accrue for the period of deferment by reason of such non-payment.

WHEN PERSON IN MILITARY SERVICE MAY HAVE INITIATED OR ACQUIRED A RIGHT IN PUBLIC LANDS

The law provides that the period of military service is equivalent to residence and cultivation of a homestead so that the right to acquire title under the homestead laws will not be forfeited. Similarly, any period of hospitalization or incapacity resulting from military service may be deducted. Any other rights, such as mining claims, mineral leases, desert rights and grazing rights, shall not be forfeited or prejudiced by reason of absence from the land or failure to perform work or make improvements. The Secretary of the Interior is required to issue through appropriate military and naval channels a notice for distribution to persons in service explanatory of the benefits of the law in connection with public lands and to furnish forms for use by persons desiring to apply for the benefits.

ADMINISTRATIVE REMEDIES

When it is shown to the satisfaction of the court that actions have been taken with intent to delay just enforcement of certain rights by taking improper advantage of the provisions of this law, the court is privileged to enter such judgments as it deems proper regardless of the provisions of this act.

A certificate signed by the Adjutant General of the Army, Chief of the Bureau of Navigation of the Navy or Major General Commandant, United States Marine Corps, shall be prima facie evidence in any proceeding under this law that the person named has not been or he is or he has been in military service; the time and place of entry and residence at that time; rank, branch and unit of service entered; dates of service and monthly pay, and time when and place where such person died in or was discharged from such service.

As stated previously, the act will remain in force until May 15, 1945, or if at that time the United States is at war, until a treaty of peace proclaimed by the President terminates the war and for six months thereafter.

A REVIEW OF DENTAL LEGISLATION IN 1941

DURING the past year, the various laws which regulate the practice of dentistry and allied professions were increased and clarified by the action of legislative bodies and by decisions of the courts. Most of the changes that were made in the laws were improvements, and it can safely be said that 1941 was a year of progress.

This review has been prepared for the purpose of presenting a summary which views individual actions as part of the general development during the year. For this reason, no attempt has been made to mention all of the proposals studied during the year. These have been described in the various reports of the Committee on Dental Legislation.

The year 1941 was a very active one from the legislative standpoint because of the fact that forty-three legislatures were in session. If this year is contrasted with 1940, when only eight legislatures met, it is evident that a larger

amount of state legislation was to be expected. In addition to this state legislative activity, Congress was in session for the entire year of 1941.

The field of legislation concerning the dental profession is logically divided into two general types, federal and state. With the exception of the District of Columbia, Congress has little to do with the laws which permit the licensing of dentists and regulation of their professional activities. This power rests with the state legislatures. Congress does have control over all dentists who are in the employ of the federal government, including those who are in the Army and the Navy. It also has the authority to enact legislation to protect the public health, and this carries with it the right to enact legislation seriously affecting the interests of the dental profession. These powers, with the other general powers of Congress, make it essential for the dental profession to study all federal legislative proposals for the protection of both its own interests and the dental health of the public.

FEDERAL LEGISLATION

One of the first problems that arose in Congress last year was the question as to whether the Selective Service Act would be administered to permit dentists to be taken into the armed forces in such a manner that the supply of dentists would be maintained and the needs of the public would not be jeopardized by the withdrawal of dentists from areas where they were most needed. There was also the problem as to whether dental students would be deferred until their graduation because of the great need for maintaining the supply of dentists. Because there was considerable doubt that these problems would be effectively handled by administrative regulation, Senator Murray of Montana drafted a bill proposing amendments to the Selective Service Act which were designed to attain these objectives. At the congressional hearing on this bill before the Senate Committee on Military Affairs, the American Dental Association, through its representatives, recommended that the bill be enacted into law if this was the only way in which these essential objectives could be attained. The Selective Service authorities opposed the enactment of the bill on the ground that adequate provision would be made for protection of the supply of dentists. Shortly thereafter, a number of steps were taken to accomplish this purpose. Consequently the need for legislative action became much less acute and the bill remains pending in committee.

Another congressional bill that has been of great interest and importance to the dental profession has been termed the "Research Bill." This bill, also introduced by Senator Murray, was introduced for the purpose of providing the United States Public Health Service with funds to enable it to conduct research on the causes of dental caries and other diseases of the mouth. This bill, introduced at the request of the American Dental Association, has received the full support of the Association at all times.

In its original form, the bill proposed an appropriation of $75,000 to begin the research program, but the Senate, before passing the bill, deleted this specific appropriation. The effect of this deletion is that, if the bill is passed by the House of Representatives and signed by President Roosevelt, its only value will be to authorize the United States Public Health Service to engage in this type of research. Before any work can be commenced, the Surgeon General of the U. S. Public Health Service must ask that the necessary funds be provided in his budget. The Surgeon General is not required to ask for the funds, although he has indicated his intention of doing so if he is given the authority to engage in dental research.

As stated previously, the research bill

has been passed by the Senate after deletion of the specific appropriation. It is now before the House of Representatives and a committee hearing has already been held. It is hoped that the bill will be passed by the House and become a law sometime in 1942.

The third federal legislative proposal which was of particular interest to the profession in 1941 was H.R. 5674, introduced by Representative Traynor of Delaware, a member of the American Dental Association. This bill was prepared for the purpose of preventing the sale of dentures to the public by mail in those states that have enacted laws that seek to prohibit this practice. It prohibits the contravening of those state laws and would make any person violating this federal law liable to a fine and imprisonment. This bill was introduced in September, and in October the House of Delegates of the American Dental Association passed a resolution endorsing the proposal. No action was taken by the House of Representatives prior to the close of the year.

The state dental societies in each of the states that have been members of the Interstate and Foreign Commerce Committee have been asked to write or wire their congressmen urging a favorable report on this bill. Reports received from the state societies indicate that prompt and extensive action is being taken.

There were other federal bills of interest to the dental profession in 1941, but in a more general way than the three just discussed. Problems involving national defense were given precedence over all other matters, with the result that a number of these bills are still pending and may become of greater importance this year.

STATE LEGISLATION

In the state legislatures last year, the legislative proposals closely affecting the interests of the profession were numerous. Thirteen states amended the dental practice act. One of these states, Florida, completely revised its law. Some of the others made important changes in several sections of the law, while a few states changed only a few words in it. Nevertheless, it is interesting to note that about one-fourth of the states amended the law in this one year. At first glance, this may appear to indicate that some major change in dental law was being made, but this does not appear to be the case. In 1939, an even greater number of amendments were made, and while complete figures are not available, it seems fairly certain that, in 1937, 1935 and 1933, there were almost as many amendments.

That the number of changes remain fairly constant over a period of years is evidently a normal occurrence, clearly illustrating the need for constant study of the subject. A review of the past few years provides an insight into the purpose of the many changes that were made in 1933, 1935 and 1937. The chief purpose of the amendments appears to have been to restrict advertising by dentists. During this period, nearly every state made amendments designed to prohibit advertising of prices, terms of credit, claims of professional superiority, unusual quality of work and other similar claims. In 1939, the most common amendment was to prohibit noncitizens from obtaining licenses. In 1941, the most common amendment was one prohibiting dental laboratories from advertising to the public. This subject will probably continue to be important in 1943, with the possibility that some new problem may arise in the meantime which will require amendment of the laws.

Of further interest in considering the 1941 legislative sessions is the fact that while there were thirteen amendments passed during the year, there were twenty-five proposed amendments that were not passed. This provides a total of thirty-

eight bills introduced in one year in which forty-three legislatures were in session, or an average of almost one to a state.

A study of the legislation in 1941 does not indicate that any detrimental laws were passed. Some of the state societies were unsuccessful in their attempts to have beneficial legislation passed, but this is not unusual in a representative form of government. Eleven bills proposing various systems of compulsory sickness insurance were introduced, but none of them made any progress toward enactment. It appears unlikely that any state will adopt such a plan of its own initiative because it presents many problems of administration and because the expense would be large. If the states could obtain financial assistance from the federal government, the situation might become very different.

Looking ahead in 1942, it seems probable that federal legislation will be of more interest and importance than that in the states. Only eight state legislatures have regular sessions scheduled, and while there may be some interesting developments in these states, the volume will necessarily be much less than last year. In Congress, however, there may be many important developments. The mail order denture bill mentioned previously may be seriously considered. The dental research bill may be passed. The Social Security Act may be extended to include all professional persons, agricultural workers, small business owners and others. In addition to these, the war may require legislation that will cause radical changes in the lives of all people, and it will be necessary to attempt to solve whatever problems arise in a manner least harmful to the public and the profession to be consistent with the national welfare.

A. B. PATTERSON, *Chairman,*
S. R. LEWIS, *Secretary,*
Committee on Legislation,
American Dental Association.

CONGRESSIONAL HEARING ON MAIL ORDER DENTURE BILL

The Committee on Interstate and Foreign Commerce of the House of Representatives held hearings on H.R. 5674, February 3 and 4. The following persons testified on February 3 in favor of the bill: Sterling V. Mead, vice-chairman, Committee on Dental Legislation; Luzerne G. Jordan, former professor of prosthetic dentistry, School of Dentistry, Georgetown University; George E. Emig, professor of prosthetic dentistry, School of Dentistry, Georgetown University; Joseph L. B. Murray, dean of the School of Dentistry, Georgetown University; William T. Wright, of the United States Public Health Service, and Philip A. Traynor, member of Congress, Delaware, author of the bill.

February 4, those persons who opposed enactment of the bill were given an opportunity to be heard and the following testified against it: Joseph S. Batt, principal owner of the Cleveland Dental Supply Company, East St. Louis, Ill.; V. C. Johnson, attorney for and connected with the U. S. Dental Company, Chicago, and William C. Church, San Antonio, attorney, representing the Cleveland Dental Supply Company.

The complete transcript of the testimony given at the hearing may not be available for several weeks. Further information concerning the progress of the bill will be forwarded in the near future.

NEWS ITEMS

SELECTIVE SERVICE RELEASE ON REHABILITATION

February 1942

PHYSICAL rehabilitation programs, intended to make many registrants who were rejected because of minor physical defects fit for active military service, have been authorized in Maryland and Virginia by National Headquarters.

Authorization of the rehabilitation programs in the two states marks the beginning of a long-planned nation-wide physical rehabilitation campaign, and when the results of these pilot tests are evaluated, a date for the inauguration of the national program will be announced.

As one of the first steps in the test programs in Maryland and Virginia, the director of Selective Service of each state will submit to national headquarters lists of physicians and dentists who are qualified to participate in the campaign for the correction of registrants' minor physical defects. When accepted and designated to render authorized professional services, physicians and dentists will receive payment from the Federal Government through the state director.

Physicians and dentists not already designated and who are named by registrants to be rehabilitated as their choice of dental or medical practitioner and other physicians and dentists who wish to take part in the program may request the necessary application form from the local board so as to obtain proper authority to treat designated registrants.

LEWIS B. HERSHEY, *Director,*
Selective Service System,
Washington, D. C.

SELECTIVE SERVICE SYSTEM: STATUS OF DENTISTS

DENTISTS classified in Class I-A who believe the loss of their services would render a hardship to the community may file an appeal within ten days from the time of mailing the notice of classification.

If a dentist desires to apply for a commission in either the Army or the Navy, he should direct a letter, outlining his willingness to serve, to: Procurement and Assignment Service, Office of Defense Health and Welfare Services, 601 Pennsylvania Ave., N. W., Washington, D. C. That office will advise him as to the necessary procedure.

NAVY RESERVE DENTAL CORPS COMMISSIONS

AT press time for the February issue of THE JOURNAL, word was received that the Navy was accepting applications for reserve commissions from men who had not passed the age of 44.

Before THE JOURNAL was distributed, the ruling was again changed and, as a result of the change, many members have been inconvenienced.

The new ruling places the age at the point where it has been for some time. Applications are now accepted only from men who have not passed the age of 35.

CURRENT LITERATURE

Dehydration

By Joseph B. Barron

In the dehydrated person, quality as well as quantity of fluid is important. Dehydration results from acute fever, infection, hemorrhage, low fluid intake, psychic disturbances such as pain or fear, prolonged gas anesthesia, excessive vomiting, diarrhea, burns and shock. It is deleterious to healing. Its symptoms are elevated temperature, increased concentration of urine, dryness of the oral membranes and thirst. In ordinary circumstances, especially for most oral surgical cases, dehydration may be prevented by administration of fruit juices and milk.—*Am. J. Orthodontics*, 27:685, December 1941.

H. B. McCauley.

Secondary or Postoperative Parotitis

By G. F. Madding and R. E. Fricke

Postoperative complications of parotitis are rare. Clinical symptoms appear between the first and fifth postoperative days. Fever, swelling over the gland and, in most cases, some discomfort in moving the jaw are present. The most commonly accepted theory of pathogenesis is that the infection ascends the parotid duct. The methods of treatment include application of hot or cold packs, diathermy, irradiation and surgical incision when suppuration occurs. The author recommends use of the roentgen rays as the treatment of choice, since it shortens the discomfort of the patient and obviates the use of radium packs.—*Surgery*, 11:45, January 1942.

V. H. Powell.

Replacement and Control of Maxillofacial Fractures

By H. D. Gillies

Fractured facial bones should be disimpacted and replaced in normal position as soon as the shock period has passed. Prompt replacement contributes to safety by establishing natural circulation and drainage. In cases of late treatment, fracture lines should be opened gently to obtain reduction. The maintenance of drainage for about a week and the removal of involved teeth, sequestra and pus result in rapid union and healing.

A new method of control for mandibular fractures, called the Roger Anderson two-pin method, was designed for finger fractures. The appliance consists of double-pronged ends, which are inserted into the fragments. The fracture is reduced visually and fixed by means of connecting rods and clamps outside the face. The method is best adapted to the edentulous posterior type of mandibular fracture.—*Brit. D. J.*, 71:351, December 1, 1941.

H. B. McCauley.

Stretcher Head Support in Cases of Smashed Jaw

By J. C. Paisley

An appliance for supporting the heads of patients with fractured jaws is designed to eliminate the discomfort and possible further damage to the jaw associated with the usual method of carrying the patient face down with the head hanging over the end of the stretcher. Two crossbars of three-eighths inch soft steel with bent ends are slipped over the stretcher handles. Two bars at right angles connect these, forming a rectangle about 10 inches long and 7 inches across, in which the patient's head is supported, above and below, by triangular bandages knotted to the handles of the stretcher. —*Brit. M. J.*, 1:16, January 3, 1942.

Basil G. Bibby.

Lupus Erythematosus Hypertrophicus et Profundus

By P. E. Bechet

Lupus erythematosus hypertrophicus et profundus is sufficiently uniform, definite and distinctive to be established as a recognizable variant of lupus erythematosus. The differential diagnosis of Boeck's sarcoid, lupus erythematosus profundus, angiolupoid and other variants is clinically possible.

The lesions, which are sharply outlined, oval, verrous-like plaques with indurated hard borders, may be observed on the upper part of the face, but have a predilection for the lower lip, the sides of the mouth and the chin. When the lip is involved, the diseased area may spread well beyond the vermilion border, greatly disfiguring the patient. As the lesions undergo involution, they sometimes leave mutilating, unsightly areas of atrophy.—*Arch. Dermat. & Syph.*, 45:33, January 1942.

PETER P. DALE.

Dental Caries and Its Control by Mineral Salts

By R. G. TORRENS

IN observations on numerous children with rampant caries, examined at the Royal Victoria and West Hants Hospital, Bournemouth, England, the persistent daily administration of certain mineral salts one-half to one hour before breakfast improved the general and local conditions of the disease in one month's time. Intermittent administration of the minerals for a period less than one year has no permanent value. Properly carried out, this method for controlling caries should show a small percentage of failures, which can be further reduced by an understanding of the theoretical principles involved.—*Brit. D. J.*, 71:385, December 15, 1941.

H. B. MCCAULEY.

Blood Vessels of the Dental Pulp

By L. R. BOLING

Two methods were employed for studying the blood vessels of the dental pulp of cats and dogs: (1) graphic reproduction from serial sections and (2) clearing of injected decalcified whole jaws. From four to eight arterioles enter each tooth or each root of a two-rooted tooth. In the adult tooth, each vessel makes its entrance through an individual foramen in the dentin and cementum. The vessels arise independently of the larger arterioles supplying bone and gingivae or, in some cases, as branches of these larger vessels. The arterioles to the pulp send very few branches to the periodontium. There is free anastomosis in the crown between arteries, even between those entering separate roots. Venules leave the pulp with the arteries or through separate foramina. They join freely with the vessels of the periodontium. Vessels occasionally are found penetrating the dentin at points distant from the apical foramina.—*Anat. Rec.*, 82:25, January 1942.

J. EDWARD GILDA.

Diffusion Experiments with Silver Nitrate

By W. STEWART ROSS

EXPERIMENTS on a number of recently erupted, freshly extracted posterior teeth indicate that Howe's ammoniacal silver nitrate readily diffuses into damaged or faulty enamel and open dentinal tubules. Formation of silver proteinate provides an effective seal, preventing the further penetration of dyes. The results suggest an explanation for the clinical observation that silver nitrate effectively prevents dental caries.—*Brit. D. J.*, 71:12, December 1941.

PETER P. DALE.

Behavior of Normal and Abnormal Facial Growth Patterns

By A. G. BRODIE

SERIAL x-ray films of the human face and injections of alizarin red S in monkeys reveal a regular pattern of bone growth and show the sites of bone deposition, respectively. This study deals principally with two stages of the skeletal growth process, morphogenesis and appositional growth. Morphogenesis is that stage in which the basic pattern of the part is laid down, and appositional growth occurs on this pattern. Appositional growth follows definite patterns that may be expressed as locus, rate, age and time gradients. Adverse constitutional factors operating during the various stages of development can affect only the sites or processes active at that time, so that such disturbances are seen to be on a time basis, rather than on a basis of specificity of the operating agent. The effects of an arrest do not seem to be compensated for by a subsequent acceleration of growth of the affected part, a disproportion of attained size between parts resulting. Certain abnormal cases occurring in human beings tend to confirm these concepts.—*Am. J. Orthodontics*, 27:633, November 1941.

J. EDWARD GILDA.

Effect of Magnesium Deficient Diets on Oral and Dental Structures

By HERMANN BECKS and W. J. FURUTA

ON a diet containing thirteen parts of magnesium per million parts of food, the deficiency of magnesium in young rats caused histopathologic changes in the dentin and pulp which increased in severity with the extension of the experiment. After forty-one days on the diet, the dentin of the incisors lost its normal pattern, and the incisal pulp was replaced by an amorphous calcified mass with uneven staining qualities. Degeneration of the odontoblastic layer appeared at this stage, becoming quite marked after eighty-four days. After 186 days, the pulp was completely calcified and normal dentin ceased to be formed. In the molars of a rat maintained on the magnesium deficient diet for 186 days, a decrease in the number of connective tissue cells in the pulp and the loss of their protoplasmic processes were observed. Vitamin C had no apparent effect on the histologic changes in the dental tissues of magnesium-deficient rats.—*Am. J. Orthodontics*, 28:1, January 1942.

H. B. MCCAULEY.

Some Dental Observations by an Otolaryngologist

By GORDON BERRY

AN intimate relationship exists between dental disease and diseases of the ear, nose and throat. The author believes that transillumination of the teeth is indicated in every case, and if disease is detected, the patient should be referred to a competent dental consultant for vitality tests and x-ray diagnosis. The elimination of dental disease will often alleviate, if not cure, a stubborn sinus infection, recurring nasal trouble or neuralgia.—*Ann. Otol. Rhinol. & Laryng.*, 50:995, December 1941.

H. B. MCCAULEY.

Influence of the Atmospheric Temperature and Humidity upon the Dryness of the Oral Mucosa

By C. E. A. WINSLOW, L. P. HERRINGTON and J. H. NELBACH

EXPIRED air tends to have a temperature of approximately 34° C. and to contain 36 gm. of moisture per cubic meter (humidity 90 per cent). The moisture picked up on a blotting paper disk applied against the back of the oral pharynx was measured for several individuals under varying conditions of atmospheric temperature and humidity. The drying effect of the atmosphere was found to be a function of its vapor pressure, rather than of its humidity or temperature. Marked drying of the oral mucosa occurred at vapor pressures below 0.4 inches of mercury.

Drying of the oral membranes may not be harmful, but if it is to be controlled, at least 50 per cent humidity must be maintained in normal indoor air at 70° F.—*Am. J. Hyg.*, 35:27, January 1942.

H. B. MCCAULEY.

In Vivo and In Vitro Exchange of Phosphorus by Enamel and Dentin

By C. P. BARNUM and W. D. ARMSTRONG

THE uptake of radioactive phosphorus by the enamel, dentin and bone of four cats five days after administration of the element was determined, with transportation of phosphate from the saliva to the dentin via the enamel, and from the pulp to the enamel via the dentin. In vivo, it was postulated that more phosphate reached the enamel through the pulp and dentin than was absorbed directly from the saliva. The ratio of radiophosphorus exchange by 1 gm. of enamel to that of 1 gm. of dentin was 0.07. Phosphorus metabolism in the enamel is about 5 per cent of that in dentin.—*Am. J. Physiol.*, 135:478, January 1, 1942.

H. B. MCCAULEY.

Osteomyelitis of the Maxilla and Mandible in a Newborn Infant Due to Staphylococcus Aureus: Report of a Case

By J. H. TURNER

A 2-weeks-old boy was admitted to Fordham Hospital, New York, because of a slight discharge from the right eye, swelling of the right cheek and a fever of twenty-four hours' duration. Maxillary osteomyelitis in infants presents a uniform clinical picture of swelling of the cheek and eyelids on the side involved, drainage of pus inside and outside the oral cavity, a unilateral discharge through the nose, sequestration and loss of deciduous teeth and permanent tooth buds. The malady occurs in otherwise healthy babies between 2 and 10 weeks of age. The prog-

nosis is ordinarily good. Children surviving the initial onslaught of the disease usually recover, but convalescence may be prolonged by frequent sequestration of bone and tooth buds. Facial and palatal deformity and absence of teeth are the final results.—*Arch. Pediat.*, 59:1, January 1942.

H. B. MCCAULEY.

Internal Wire Fixation for Fractures of Jaw—Preliminary Report

By J. B. BROWN and F. MCDOWELL

IN certain fractures of the lower jaw in which interdental wiring is not possible, one or two stainless steel wires (0.5 to 0.8 inches in diameter) may be placed through the body of the mandible, with an external approach, insuring fixation in one plane only. The fragments are prevented from rotating or pulling apart by the addition of an anterior wire dental arch, although the addition of small nuts to the threaded wire may be sufficient to hold the fragments together. Mandible and maxillae may or may not be wired together. The technic for insertion of the wire and the indications for its use are given.—*Surg. Gynec. & Obst.*, 74:227, February 1942.

J. EDWARD GILDA.

One Hundred One Cases of Infection of the Face and Neck Following Oral Pathology

By G. R. O'BRIEN and L. R. RUBIN

INFECTION of the face and neck is often associated with some pathologic condition in the oral cavity. A review of the anatomy of the neck gives a detailed discussion of the fascial compartments. Reports are made of 101 cases of infection of the neck and face directly attributed to oral disease. The greatest number of complications were found in patients between the ages of 11 and 30 years. In a number of the cases, there was no surgical intervention, while the most serious ones followed extraction of teeth. The mandibular molars were involved more frequently than the maxillary molars.

The authors suggest the following surgical treatment for such cases: "(a) careful mouth hygiene, (b) chemotherapy: sulfonilamide, (c) intravenous medication, (d) transfusions, (e) nasal feeding when necessary and practical, (f) prompt incision and drainage, (g) postoperative irrigations through the rubber tube drain, (h) tracheotomy when indicated, (i) ligation of the external carotid on continued hemorrhage into the fascial spaces and (j) ligation of the internal jugular vein when it is involved."—*Am. J. Surg.* (New Series), 55:102, January 1942.

JAMES T. GINN.

Extra-Oral Anesthesia Through Foramen Rotundum by the Supramalar Route

By M. VALENZUELA D.

FOR anesthesia of the superior maxillary nerve, an extra-oral injection is made through an area free of important vessels, thus preventing formation of hematomas and edema. —*Mil. Surgeon*, 90:185, February 1942.

J. EDWARD GILDA.

Local Use of Sulfanilamide and Sulfathiazole in Extraction Wounds: A Preliminary Report

By L. WEINER

OF 1,065 teeth that were extracted, 343 sockets were selected as controls, 381 were treated with sulfathiazole and the remaining 341 were treated with sulfanilamide. Although the patients were unselected, an attempt was made to use those cases requiring extraction of three or more teeth. This made possible the local application of both drugs in addition to providing a control socket in a single mouth. Of the controls, five developed postoperative infection, an incidence of 1.46 per cent. In those extractions in which sulfathiazole was used, only one socket became infected, an incidence of 0.26 per cent. None of the sockets in which sulfanilamide was used became infected. In the six cases developing postoperative infection, sulfathiazole was used in every instance.—*Mil. Surgeon*, 90:157, February 1942.

J. EDWARD GILDA.

ANNOUNCEMENTS

Announcements must be received by the fifth day of the month in order to be published in the forthcoming issue of The Journal.

CALENDAR OF MEETINGS

American Association of Orthodontists, New Orleans, La., March 16-19.

American Board of Orthodontics, New Orleans, La., March 14-16.

American Dental Assistants Association, Boston, Mass., August 24-28.

American Dental Association, Boston, Mass., August 24-28.

American Society for the Advancement of General Anesthesia in Dentistry, New York, March 23.

American Society of Oral Surgeons and Exodontists, Boston, Mass., August 20-22.

Brooklyn (N. Y.) Society for Oral Diagnosis, March 24.

Cleveland (Ohio) Dental Society, May 4-6.

District of Columbia Dental Society, second and fourth Tuesdays in each month, from October to June at the United States Public Health Service Auditorium, Washington.

Five State Post Graduate Clinic, Washington, D. C., March 8-12.

National Board of Dental Examiners, May 4-5.

Ohio State University Dental College Alumni Meeting, Columbus, April 15-16.

Ontario Dental Association, Toronto, May 18-21.

Southwestern Society of Orthodontists, New Orleans, La., March 16-19.

Thomas P. Hinman Midwinter Clinic, Atlanta, Ga., March 23-24.

STATE SOCIETIES

March

Minnesota, at St. Paul (3-5)
Kentucky, at Louisville (30-April 3)
Wisconsin, at Milwaukee (23-25)

April

Alabama, at Birmingham (7-9)
California, at Sacramento (13-15)
Connecticut, at Bridgeport (29-May 1)
Kansas, at Wichita (26-29)
Michigan, at Detroit (20-22)
Mississippi, at Jackson (20-22)
Oklahoma, at Tulsa (19-22)
Texas, at San Antonio (26-30)
Virginia, at Roanoke (6-8)

May

Arkansas, at Little Rock (18-20)
Georgia, at Savannah (17-20)
Illinois, at Springfield (11-14)
Indiana, at Indianapolis (18-20)
Iowa, at Des Moines (4-6)
Louisiana, at Lake Charles (7-9)
Maryland, at Baltimore (4-5)
Missouri, at St. Louis (24-27)
Montana, at Butte (7-9)
Nebraska, at Lincoln (11-13)
New Jersey, at Atlantic City (6-8)
New York, at New York (11-15)
North Carolina, at Greensboro (11-13)
North Dakota, at Jamestown (11-13)
South Carolina, at Greenville (4-6)
South Dakota, at Sioux Falls (13-15)
Tennessee, at Chattanooga (11-14)
Vermont, at Burlington (20-21)
West Virginia, at Clarksburg (18-20)

June

Colorado, at Colorado Springs (18-20)
Idaho, at Lewiston (8-10)
Wyoming, at Laramie (22-24)

STATE BOARDS OF DENTAL EXAMINERS

Arizona, at Phoenix, June 29-July 2. R. K. Trueblood, 25 N. Second Ave., Glendale, Secretary.

California, at San Francisco, May 25, and at Los Angeles, June 15. Kenneth I. Nesbitt, 515 Van Ness Ave., San Francisco, Secretary.

Florida, at Jacksonville, June 22-26. H. B. Pattishall, 351 St. James Bldg., Jacksonville, Secretary.

Kentucky, at Louisville, June 9-12. Leon

M. Childers, 1312 First Nat'l Bank Bldg., Lexington, Secretary.

Maine, at Augusta, June 22-24. Carl W. Maxfield, 31 Central St., Bangor, Secretary.

Montana, at Helena, second Monday in July. D. H. McCauley, Laurel, Secretary.

New Jersey, June 29-July 4. W. A. Wilson, 150 East State St., Trenton, Secretary.

New Mexico, at Santa Fe, June 15-18. J. J. Clarke, Artesia, Secretary.

North Dakota, at Fargo, June 13-16. L. I. Gilbert, 401 Black Bldg., Fargo, Secretary.

Pennsylvania, at Philadelphia and Pittsburgh, June 16-20. Reuben E. V. Miller, 61 N. Third St., Easton.

Vermont, at Montpelier, June 22-24. C. I. Taggart, 139 Bank St., Burlington, Secretary.

West Virginia, at Charleston, June 29-July 2. R. H. Davis, 510 Goff Bldg., Clarksburg, Secretary.

Wisconsin, at Milwaukee, June 1-5. Stephen F. Donovan, Tomah, Secretary.

AMERICAN ASSOCIATION OF ORTHODONTISTS

THE 1942 meeting of the American Association of Orthodontists will be held at the Roosevelt Hotel, New Orleans, La., March 16-19. This will be a pan American congress. A special invitation is extended to orthodontists in Central and South America.

MAX E. ERNST, *Secretary,*
1250 Lowry Medical Arts Bldg.,
St. Paul, Minn.

AMERICAN BOARD OF ORTHODONTICS

THE 1942 meeting of the American Board of Orthodontics will be held at the Roosevelt Hotel, New Orleans, La., March 14-16. Orthodontists who desire to be certificated by the board can obtain application blanks from

BERNARD G. DEVRIES, *Secretary,*
Medical Arts Bldg.,
Minneapolis, Minn.

AMERICAN DENTAL ASSISTANTS ASSOCIATION

THE eighteenth annual session of the American Dental Assistants Association will be held in Boston, Mass., August 24-28. For further information, address

AILEEN M. FERGUSON,
General Secretary,
709 Centre St.,
Jamaica Plain, Mass.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY

THE Spring meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held Monday evening, March 23, at the Midston House, 38th St. and Madison Ave., New York. James R. Cameron, Philadelphia, professor of oral surgery, Temple University, will read a paper entitled "Anesthesia from the Viewpoint of the Operating Surgeon."

M. HILLEL FELDMAN, *Secretary,*
750 Fifth Ave.,
New York.

AMERICAN SOCIETY OF ORAL SURGEONS AND EXODONTISTS

THE twenty-fourth annual meeting of the American Society of Oral Surgeons and Exodontists will be held in Boston, Mass., August 20-22, with headquarters in the Copley-Plaza Hotel.

HARRY BEAR, *Secretary,*
410 Professional Bldg.,
Richmond, Va.

BROOKLYN SOCIETY FOR ORAL DIAGNOSIS

THE Brooklyn (N. Y.) Society for Oral Diagnosis will meet March 24 at 8:30 p.m. in the Granada Hotel. Essayist: Jacob Stolzenberg, chief orthodontist, Unity and Lutheran hospitals; subject: "Orthodontic Diagnosis and Its Relationship to Naso-respiratory Dysfunction." Discussors: Max Rabiner, M.D., assistant professor of oto-laryngology, Post Graduate Medical School, New York; Charles Dumay, M.D., Brooklyn pediatrician. Medical and dental practitioners are invited.

H. AUSUBEL, *Chairman,*
Publicity Committee,
1 DeKalb Ave.,
Brooklyn.

CLEVELAND DENTAL SOCIETY

THE Annual Spring Clinic Meeting of the Cleveland (Ohio) Dental Society will be held May 4-6 at the Statler Hotel, Cleveland.

ALBIUN F. SADD, *Chairman,*
Publicity Committee,
562 Rose Bldg.,
Cleveland, Ohio.

FIVE STATE POST GRADUATE CLINIC

THE annual Five State Post Graduate Clinic of the District of Columbia Dental Society will be held at the Mayflower Hotel, Washington, D. C., March 8-12.

WILLIAM D. CURTIS, *Chairman,*
Publicity Committee.

NATIONAL BOARD OF DENTAL EXAMINERS

THE National Board of Dental Examiners will hold its next session for the examination of candidates in Parts I and II, May 4-5, in schools where there are five or more candidates. For further information and application blanks, address

MORTON J. LOEB, *Secretary,*
66 Trumbull St.,
New Haven, Conn.

OHIO STATE UNIVERSITY ALUMNI MEETING

THE Ohio State University Dental College Alumni will meet for a two-day educational and scientific program, April 15-16. All Ohio dentists are invited to attend. Invitations, reservation cards and programs will be mailed to the Ohio State University alumni. Graduates of other schools wishing to receive them will be supplied on communication with the Dental College, Ohio State University.

FRANK C. STARR, *Chairman of Publicity.*

ONTARIO DENTAL ASSOCIATION

THE seventy-fifth annual convention of the Ontario Dental Association will be held at the Royal York Hotel, Toronto, May 18-21. Dentists from the United States and all parts of Canada will be welcome.

EDMUND A. GRANT, *President.*

SOUTHWESTERN SOCIETY OF ORTHODONTISTS

THE February meeting of the Southwestern Society of Orthodontists has been postponed. A regular business session will be held during the meeting of the American Association of Orthodontists, New Orleans, March 16-19.

R. E. OLSON, *Secretary,*
Union Nat'l Bank Bldg.,
Wichita, Kan.

THOMAS P. HINMAN MIDWINTER CLINIC

THE Thomas P. Hinman Midwinter Clinic will be held at the Biltmore Hotel, Atlanta, Ga., March 23-24.

JOSEPH D. OSBORNE, *Secretary,*
604 Doctors Bldg.,
Atlanta, Ga.

ALABAMA DENTAL ASSOCIATION

THE next annual meeting of the Alabama Dental Association will be held April 7-9 at the Tutwiler Hotel, Birmingham.

GEORGE W. MATTHEWS, *Secretary,*
905 Protective Life Bldg.,
Birmingham.

ARKANSAS STATE DENTAL ASSOCIATION

THE next annual meeting of the Arkansas State Dental Association will be held at Little Rock, May 18-20.

I. M. STERNBERG, *Secretary,*
Merchants Bank Bldg.,
Fort Smith.

CALIFORNIA STATE DENTAL ASSOCIATION

THE California State Dental Association will hold its next annual meeting April 13-15 in Sacramento.

FREDERICK T. WEST, *Secretary,*
450 Sutter Street,
San Francisco.

COLORADO STATE DENTAL ASSOCIATION

THE next annual meeting of the Colorado State Dental Association will be held at the Broadmoor, Colorado Springs, June 18-20.

C. K. PHILLIPS, *Secretary,*
529 Majestic Bldg.,
Denver.

CONNECTICUT STATE DENTAL ASSOCIATION

THE next annual meeting of the Connecticut State Dental Association will be held April 29-May 1 at the Hotel Stratfield, Bridgeport.

EARLE S. ARNOLD, *Secretary,*
37 Linnard Road, W.,
Hartford.

GEORGIA DENTAL ASSOCIATION

THE next annual meeting of the Georgia Dental Association will be held at the Hotel DeSoto, Savannah, May 17-20.

R. H. MURPHY, *Secretary,*
920 Persons Bldg.,
Macon.

IDAHO STATE DENTAL ASSOCIATION

THE next annual meeting of the Idaho State Dental Association will be held June 8-10 at Lewiston.

REX W. BARSTOW, *Secretary,*
Moscow.

ILLINOIS STATE DENTAL SOCIETY

THE Illinois State Dental Society will hold its next annual meeting May 11-14 at Springfield.

L. H. JACOB, *Secretary,*
634 Jefferson Bldg.,
Peoria.

INDIANA STATE DENTAL ASSOCIATION

THE next annual meeting of the Indiana State Dental Association will be held May 18-20 at the Claypool Hotel, Indianapolis.

E. E. EWBANK, *Secretary,*
Kingman.

IOWA STATE DENTAL SOCIETY

THE next annual meeting of the Iowa State Dental Society will be held at Hotel Fort Des Moines, Des Moines, May 4-6.

C. S. FOSTER, *Secretary,*
803 Dows Bldg.,
Cedar Rapids.

KANSAS STATE DENTAL ASSOCIATION

THE next annual meeting of the Kansas State Dental Association will be held at the Allis Hotel, Wichita, April 26-29.

FRED A. RICHMOND, *Secretary,*
1008 Huron Bldg.,
Kansas City.

KENTUCKY STATE DENTAL ASSOCIATION

THE next annual meeting of the Kentucky State Dental Association will be held at the Brown Hotel, Louisville, March 30-April 3.

J. L. WALKER, *Secretary,*
640 Barbee Way South,
Louisville.

LOUISIANA STATE DENTAL SOCIETY

THE next annual meeting of the Louisiana State Dental Society will be held at the Charleston Hotel, Lake Charles, May 7-9.

JULIAN S. BERNHARD, *Secretary,*
419 Medical Arts Bldg.,
Shreveport.

MARYLAND STATE DENTAL ASSOCIATION

THE next annual meeting of the Maryland State Dental Association will be held at the Belvedere Hotel, Baltimore, May 4-5.

P. A. DEEMS, *Secretary,*
835 Park Ave.,
Baltimore.

MICHIGAN STATE DENTAL SOCIETY

THE next annual meeting of the Michigan State Dental Society will be held in Detroit, April 20-22.

WILLIAM R. DAVIS, *Secretary,*
Michigan Department of Health,
Lansing.

MISSISSIPPI DENTAL ASSOCIATION

THE next annual meeting of the Mississippi Dental Association will be held in Jackson, April 20-22.

O. L. COLEE, *Secretary,*
Magnolia.

MISSOURI STATE DENTAL ASSOCIATION

THE next annual meeting of the Missouri State Dental Association will be held at the Hotel Jefferson, St. Louis, May 24-27.

C. W. DIGGES, *Secretary,*
Exchange National Bank Bldg.,
Columbia.

MONTANA STATE DENTAL ASSOCIATION

THE next annual meeting of the Montana State Dental Association will be held in Butte, May 7-9.

T. T. RIDER, *Secretary,*
9 Higgins Block,
Missoula.

NEBRASKA STATE DENTAL ASSOCIATION

THE next annual meeting of the Nebraska State Dental Association will be held at the Cornhusker Hotel, Lincoln, May 11-13.

C. A. BUMSTEAD, *Secretary,*
Stuart Bldg.,
Lincoln.

NEW JERSEY STATE DENTAL SOCIETY

THE next annual meeting of the New Jersey State Dental Society will be held at the

Ambassador Hotel, Atlantic City, May 6-8.

F. K. HEAZELTON, *Secretary,*
223 E. Hanover St.,
Trenton.

DENTAL SOCIETY OF THE STATE OF NEW YORK

THE next annual meeting of the Dental Society of the State of New York will be held at the Hotel Pennsylvania, New York, May 11-15.

CHARLES A. WILKIE, *Secretary,*
1 Hanson Place,
Brooklyn.

NORTH CAROLINA DENTAL SOCIETY

THE next annual meeting of the North Carolina Dental Society will be held at the O'Henry Hotel, Greensboro, May 11-13.

E. M. MEDLIN, *Secretary,*
Aberdeen.

NORTH DAKOTA STATE DENTAL ASSOCIATION

THE next annual meeting of the North Dakota State Dental Association will be held in Jamestown, May 11-13.

W. D. TOEPKE, *Secretary,*
New Salem.

OKLAHOMA STATE DENTAL SOCIETY

THE next annual meeting of the Oklahoma State Dental Society will be held in Tulsa, April 19-22.

EUGENE W. WISE, *Secretary,*
Medical Arts Bldg.,
Tulsa.

SOUTH CAROLINA STATE DENTAL ASSOCIATION

THE next annual meeting of the South Carolina State Dental Association will be held in Greenville, May 4-6.

P. B. HAIR, *Secretary,*
Spartanburg.

SOUTH DAKOTA STATE DENTAL SOCIETY

THE next annual meeting of the South Dakota State Dental Society will be held in Sioux Falls, May 13-15.

ERNEST W. ELMEN, *Secretary,*
Sioux Falls.

TENNESSEE STATE DENTAL ASSOCIATION

THE next annual meeting of the Tennessee State Dental Association will be held at the Hotel Patten, Chattanooga, May 11-14.

HOWARD M. TAYLOR, *Secretary,*
202 Medical Art Bldg.,
Knoxville.

TEXAS STATE DENTAL SOCIETY

THE next annual meeting of the Texas State Dental Society will be held in San Antonio, April 26-30.

WILLARD OGLE, *Secretary,*
Medical Arts Bldg.,
Dallas.

VERMONT STATE DENTAL SOCIETY

THE next annual meeting of the Vermont State Dental Society will be held in Burlington, May 20-21.

J. GILLAM IRONS, *Secretary,*
Bennington.

VIRGINIA STATE DENTAL ASSOCIATION

THE next annual meeting of the Virginia State Dental Association will be held at the John Marshall Hotel, Roanoke, April 6-8.

J. E. JOHN, *Secretary,*
Medical Arts Bldg.,
Roanoke.

WEST VIRGINIA STATE DENTAL SOCIETY

THE next annual meeting of the West Virginia State Dental Society will be held in Clarksburg, May 18-20.

C. G. ANDERSON, *Secretary,*
Mount Hope.

WISCONSIN STATE DENTAL SOCIETY

THE next annual meeting of the Wisconsin State Dental Society will be held at the Schroeder Hotel, Milwaukee, March 23-25.

KENNETH F. CRANE,
Executive Secretary,
1233 Bankers Bldg.,
Milwaukee.

WYOMING STATE DENTAL ASSOCIATION

THE next annual meeting of the Wyoming State Dental Association will be held in Laramie, June 22-24.

J. D. MCNIFF, *Secretary,*
Laramie.

ARIZONA STATE DENTAL BOARD

THE Arizona State Dental Board will hold

its annual examination of applicants for license to practice dentistry in Arizona, at Phoenix, June 29-July 2. All application blanks and fees must be in the hands of the secretary at least fifteen days prior to the date of the examination. For application blanks and other information, address

R. K. TRUEBLOOD, *Secretary,*
25 N. 2nd Ave.,
Glendale.

STATE OF CALIFORNIA BOARD OF DENTAL EXAMINERS

THE next examination to be conducted by the Board of Dental Examiners of California for license to practice dentistry or dental hygiene in the State of California will be held in San Francisco commencing May 25 at the Physicians and Surgeons College of Dentistry for theory and practical examinations and at the University of California, College of Dentistry for practical examinations. The graduates will do the practical work at their respective colleges. At Los Angeles, in the University of Southern California, College of Dentistry, examinations will be held commencing June 15. All credentials must be in the office of the secretary at least twenty days prior to the examinations. Address all communications to

KENNETH I. NESBITT, *Secretary,*
Room 203, 515 Van Ness Ave.,
San Francisco.

FLORIDA STATE BOARD OF DENTAL EXAMINERS

THE Florida State Board of Dental Examiners will hold its annual examination of applicants for license to practice dentistry or dental hygiene, at the Seminole Hotel, Jacksonville, June 22-26. Dental candidates must file preliminary applications by April 22. Final applications of dental and dental hygiene candidates must be complete by May 22. Address all communications to

H. B. PATTISHALL, *Secretary,*
351 St. James Bldg.,
Jacksonville.

KENTUCKY STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Kentucky State Board of Dental Examiners will be held June 9-12 at the University of Louisville, Dental School, Louisville. Dentists having graduated prior to 1942 and desiring to stand examination before this board must file applications, complete with full information requested, at this office not later than March 9. Applications of 1942 graduates must be in the secretary's office by May 9. Ample time should be allowed for securing all data required. For application forms and further information, apply to

LEON M. CHILDERS, *Secretary,*
1312 First Nat'l Bank Bldg.,
Lexington, Ky.

MAINE STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Maine State Board of Dental Examiners will be held June 22-24 at the State House, Augusta. Applications with the necessary fee must be in the hands of the secretary at least ten days prior to the date of the examination. Address all communications to

CARL W. MAXFIELD, *Secretary,*
31 Central St.,
Bangor.

MONTANA STATE BOARD OF DENTAL EXAMINERS

A MEETING of the Montana State Board of Dental Examiners will be held in Helena on the second Monday in July 1942. All applications for examination must be in the hands of the secretary not later than twenty days previous to the opening of the examination and must be sworn to before a notary public.

D. H. MCCAULEY, *Secretary,*
Laurel.

STATE BOARD OF REGISTRATION AND EXAMINATION IN DENTISTRY OF NEW JERSEY

THE State Board of Registration and Examination in Dentistry of New Jersey will hold its annual examinations commencing Monday, June 29 and continuing for five days thereafter. On application to the secretary, a copy of the requirements and rules for applicants, instruction sheet and preliminary application blank will be sent. Any person desiring to become a candidate must file the preliminary application, together with the examination fee of $25, on or before March 15 for the succeeding June ex-

aminations or before September 1 for the succeeding December examinations.

W. A. WILSON, *Secretary,*
150 East State St.,
Trenton.

NEW MEXICO BOARD OF DENTAL EXAMINERS

THE New Mexico State Board of Dental Examiners will hold its next examination June 15-18 at Santa Fe.

J. J. CLARKE, *Secretary,*
Artesia.

NORTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

THE North Dakota State Board of Dental Examiners will hold its next examination in the Gardner Hotel, Fargo, June 13-16. For further information and application blank, address

L. I. GILBERT, *Secretary,*
401 Black Bldg.,
Fargo.

DENTAL COUNCIL AND EXAMINING BOARD OF THE COMMONWEALTH OF PENNSYLVANIA

THE Dental Council and Examining Board of the Commonwealth of Pennsylvania will conduct examinations in Philadelphia and Pittsburgh, June 16-20. For further information and application blanks, address the Department of Public Instruction, Bureau of Professional Licensing, Dental Division, Harrisburg.

REUBEN E. V. MILLER, *Secretary,*
61 N. 3rd St.,
Easton.

VERMONT STATE BOARD OF DENTAL EXAMINERS

THE Vermont State Board of Dental Examiners will meet June 22-24 in the State House, Montpelier, to examine applicants for license to practice dentistry and dental hygiene. All applications, together with examination fee, must be in the hands of the secretary at least fifteen days before the date of the meeting. For applications and other information, address

C. I. TAGGART, *Secretary,*
139 Bank St.,
Burlington.

WEST VIRGINIA STATE BOARD OF DENTAL EXAMINERS

THE West Virginia State Board of Dental Examiners will hold its next examination for those desiring a license to practice dentistry or dental hygiene, at Charleston, June 29-July 2. For further information, address

R. H. DAVIS, *Secretary,*
510 Goff Bldg.,
Clarksburg.

STATE OF WISCONSIN BOARD OF DENTAL EXAMINERS

THE Wisconsin Board of Dental Examiners will hold its next examination at Marquette Dental School, Milwaukee, June 1-5. Examinations will be given for licensure of dentists and hygienists. All applications must be in by May 26. For application blanks and information, address

STEPHEN F. DONOVAN, *Secretary,*
Tomah.

LOCATIONS FOR DENTISTS

A NEED for additional dentists exists in many of the vital defense areas. These shortages have arisen because of the great increase in civilian population that has occurred during the year. At present, needs exist in a number of states in communities varying in size from small villages to large cities. A continuing increase in population will result in overtaxing the dental personnel in many other localities where at present the dentists are very near the limit of their capacities. In many of these defense areas, there are defense housing projects in which office space or living accommodations, or both, may be secured. The United States Public Health Service in cooperation with the Division of Defense Housing of the Federal Works Agency, which supervises these projects, is interested in acquainting dentists with the needs of these communities. If you are interested in securing more specific information about localities for the establishment of practice, communicate with

THOMAS PARRAN, *Surgeon General.*

DENTAL RESIDENCY

THE University of Oregon Medical School Hospitals and Clinics offers a residency in dental medicine and oral surgery, the period of service to be one year, with compensa-

tion $40 monthly, in addition to board, room and laundry. The division is under the general direction of the department of medicine and the direct supervision of the head of the division and a visiting staff of sixteen dentists. Service is carried on in the outpatient clinic and the three hospitals. Application blanks will be furnished on request. Direct inquiries to

RICHARD B. DILLEHUNT, *Dean,*
University of Oregon Medical School,
Portland.

RESEARCH FELLOWSHIP IN MEDICINE AND DENTISTRY AT THE UNIVERSITY OF ILLINOIS

THE Graduate School of the University of Illinois has established four research fellowships to be awarded for one year in the fields of medicine and dentistry in Chicago at a stipend of $1,200 per year (calendar year with one month's vacation). Candidates for these fellowships must have completed a training of not less than eight years beyond high school graduation. This training may have been acquired in any one of the following ways, or the equivalent thereof: 1. Work leading to the B.S. and M.D. degrees. 2. Work leading to the B.S., M.S. and D.D.S. degrees. 3. Work leading to the B.S. and B.A. degree in a four-year collegiate course and to the D.D.S. degree. 4. Work leading to the B.S., D.D.S. and M.D. degrees. The fellowship year begins September 1. Formal application blanks can be secured from the Secretary of the Committee on Graduate Work in Medicine and Dentistry, 1853 W. Polk St., Chicago, Ill.

BRONX HOSPITAL VOLUNTEERSHIPS

THE Dental Department of the Bronx Hospital offers a number of volunteerships to recent graduates in dentistry in the following branches: oral surgery and anesthesia; surgical pyorrhea; orthodontia; root canal therapy, and operative dentistry. Those offering satisfactory credentials indicating their interest in the clinical study of dental surgery as a health problem will receive consideration. Address applications to the Dental Department, Bronx Hospital, Fulton Ave. at 169th St., Bronx, New York. Appointments will begin in July.

DAVID WURZEL, *Director,*
Dental Department.

BRONX HOSPITAL DENTAL INTERNSHIP

EXAMINATION for a dental internship for one year beginning July 1 will be held April 3 at 10 a.m. at the Bronx Hospital, Fulton Avenue at 169th St., Bronx, N. Y. The Bronx Hospital is a modern institution with a capacity of 329 beds for acute diseases. It has a very active outpatient department in dentistry, including periodontia, orthodontia, oral surgery, root canal therapy and operative dentistry. Write for application form to the superintendent of the hospital.

INTERNSHIP APPOINTMENTS

THE Walter G. Zoller Memorial Dental Clinic, University of Chicago, offers four rotating internship appointments, effective July 1, 1942, to June 30, 1943. The clinic maintains four divisions of service: 1. The Zoller Clinic in Billings Hospital for general dental service. 2. The University Dental Clinic in Billings Hospital for diagnosis and minor oral surgery. 3. The Prenatal Dental Clinic in Chicago Lying-In Hospital for general service. 4. The Orthopedic Dental Clinic in the Home for Destitute Crippled Children for general dentistry. In addition to clinical practice, the intern will assist in the department of anesthesia and have the privilege of attending all departmental seminars on dentistry, medicine, pathology, etc. Those seniors interested should write immediately for application blanks to the Director, Walter G. Zoller Memorial Dental Clinic, University of Chicago, Chicago.

CARNEGIE FELLOWSHIPS FOR RESEARCH AND GRADUATE WORK IN THE DENTAL SCIENCES

AIDED by the Carnegie Corporation, the School of Medicine and Dentistry of the University of Rochester offers scholarships paying $1,200-$1,800 per annum to well-trained dental graduates who are interested in research or who desire special training in the basic medical sciences as an aid to dental teaching or practice. A few fellowships also offer part-time training in oral surgery. On appointment, the applicant is given the title of Carnegie Dental Fellow and, according to his interest, works as a graduate student in one of the departments of the medical schools. Here, excellent laboratory facilities, adequate direction and

close contact with various investigations related to medicine and dentistry help his research and study. Fellows are encouraged to attend medical classes, seminars and staff meetings and, when opportunity presents itself, to participate in class instruction and scientific meetings. Contact with the problems of clinical dentistry may be maintained through the Oral Surgery Clinic of the Strong Memorial Hospital and the Rochester Dental Dispensary. With the approval of the Graduate Council of the university, Fellows may prepare themselves for the degree of M.S. or Ph.D. Applications should be made to

GEORGE H. WHIPPLE, *Dean*,
School of Medicine and Dentistry,
Rochester, N. Y.

POSTGRADUATE COURSE IN PERIODONTIA

THE New York University College of Dentistry will hold its ninth annual postgraduate course in periodontia for twenty sessions, as follows: Schédule A, morning and afternoon sessions, June 15-26. Schedule B, morning and afternoon sessions, June 15-17; mornings only, June 18-July 8. Fee $100. Course limited to fifteen men. Preference given in order of receipt of application. The course will include etiology, diagnosis and treatment of periodontal disease; various technics of pocket eradication, with conservative treatment stressed; Vincent's infection; diagnosis of types of bone resorption; mouth manifestations of systemic disease; periodontal foci of infection; toothbrushing; instrumentation, diet; balancing of occlusion; taught by lectures and clinical work, each student treating several cases. Instruction by Samuel Charles Miller, Sidney Sorrin, J. Lewis Blass and the entire periodontia faculty. For further information and application, address the Office of the Dean, New York University College of Dentistry, 209 E. 23rd St., New York, N. Y.

DENTAL RESIDENTSHIP

A TWELVE months' dental residentship is available at the Western Pennsylvania Hospital, Pittsburgh, beginning July 1. The applicant for this position must be a graduate dentist holding a Pennsylvania license and having had the minimum of one year's dental internship in a recognized hospital. A salary of $83.33 per month with maintenance is offered with the position.

J. A. GARDNER, *Chief*,
Dental Department.

POSTGRADUATE COURSES, COLLEGE OF DENTISTRY, OHIO STATE UNIVERSITY

THE College of Dentistry of Ohio State University, Columbus, offers postgraduate courses in dentistry that are especially designed for the general practitioner who may wish to amplify his training in any of the following fields: x-ray technic and diagnosis (course offered June 8-12); crown and bridge work (June 15-20); oral surgery (June 15-19); prosthodontia (June 15-20); operative dentistry (June 15-19), and root canal therapy (June 15-19). Periodontia will be offered one day per week for ten consecutive weeks beginning June 17. The fee for these courses in $50. A postgraduate course in orthodontics is offered on a part-time basis. The fee and length of course is determined by the scope of the student's fundamental undergraduate training in this subject. Registration in all courses is limited to ten men. It is the aim of these courses to teach new technics as well as to review fundamentals. For further information and application blanks, address the Dean, College of Dentistry, Ohio State University, Columbus, Ohio.